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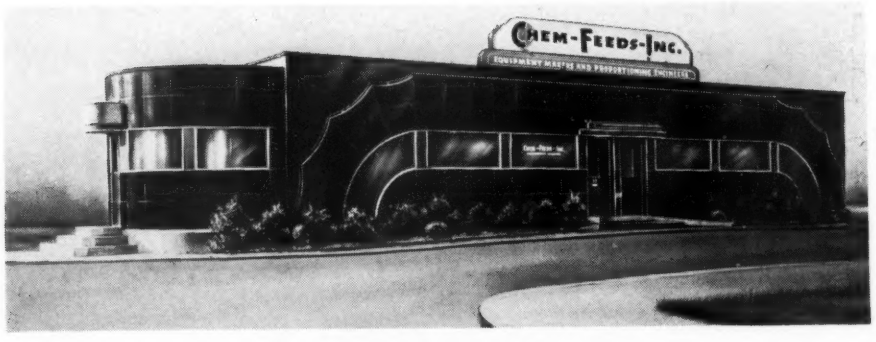

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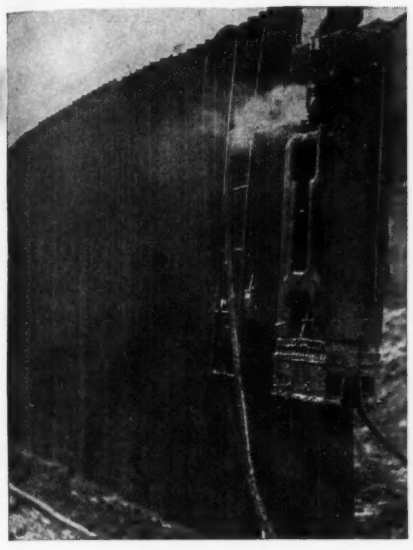

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Vol. 74 No. 4

A. PRESCOTT FOLWELL, Editor

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THE WAR EMERGENCY

Preference Orders for Sewage Plants

Speaking on March 25th, before the New Jersey Sewage Works Ass'n, Maury Maverick, Director, Governmental Division, War Production Board, explained briefly the present status of preference orders as they affect sewage treatment plants. Said he:

"As you know, Preference Rating Order P-46, covering repair and operating supplies for utilities, has been superseded by two orders, U-1 and P-141. The former, issued by the Office of Utilities, does not cover public sanitation services. P-141, issued by the Director General for Operations, February 27, 1943, covers only public sanitation services and is administered by the Governmental Division. Insofar as public sanitation service is concerned, this order is substantially the same as P-46. On February 9, 1943, the War Production Board issued CMP Regulation No. 5, which also affects sanitation services.

"This regulation provides a method for obtaining controlled materials and other products and materials needed for essential maintenance, repair and operating supplies for specified businesses and services. Ratings to be given are determined by listings in Schedules I and II which accompany the Regulation. Sanitation services are included in Schedule I which carries a rating of AA-1.

"The War Production Board has recently issued CMP Regulation 5A which, with a few exceptions not applicable to sanitation services, takes the place of CMP Regulation No. 5 insofar as the governmental agencies and institutions are concerned. This regulation makes provision for maintenance, repair and operating supplies for sanitary sewers and sewage disposal, refuse collection and disposal and storm sewers.

"In order to conform with the Controlled Materials Plan, and particularly with CMP Regulation No. 5A, it will be necessary to revise Order P-141. This revision is now in process and careful consideration to sewage problems is being given.

"Whenever you have problems, let us know. In writing about these matters, address your letter to the Governmental Division, Reference P-141. While we have tried to keep municipal officials advised through news releases, we know that we have not fully succeeded in doing so. Therefore, to augment these, arrangements have now been made to mail copies of Order P-141 and any changes that may be made to all cities of ten thousand population or larger and it is hoped that this service eventually can be extended to all. In addition, a simplified interpretation of existing orders in popular language, is now being prepared and will also be forwarded to those on the mailing list."

Another order, P-19-h, effective March 1, permits the assignment of priority ratings not only to construction material but also to tools, repair parts for construction machinery, forms, scaffolding and the like, used in connection with the construction of an approved project. This project rating order also enables an applicant to acquire all needed materials on one application.

States Pooling Road Machinery

As stated last month, WPB has formulated a plan for voluntary equipment pooling by states. Up to a few days ago 14 states had adopted the plan and 30 others were studying it. It is believed that all will have adopted it by May 1st.

WPB Revokes Authority for Road Construction

On March 15 WPB revoked the authority to begin construction granted in Serial Number L-41-600 issued May 8, 1942. Henceforth no road construction jobs may be commenced, *under any circumstances,* without previous authority being granted by the War Production Board. This holds true regardless of whether priorities assistance is required or the use of critical materials involved. Under the new procedure applications for authority to begin construction must be made through the appropriate District Engineer of the Public Roads Administration. Projects involving an estimated cost of less than $100,000 will be referred, with recommendations of the District Engineer, to the regional office of the War Production Board for processing. Although administrative procedure has not as yet been officially announced, it is nevertheless understood that in all such cases the recommendation of the PRA District Engineer will be followed by the WPB Regional Office. Applications involving a cost of $100,000 or over will be forwarded by the District Engineer to Washington, D. C., for processing.

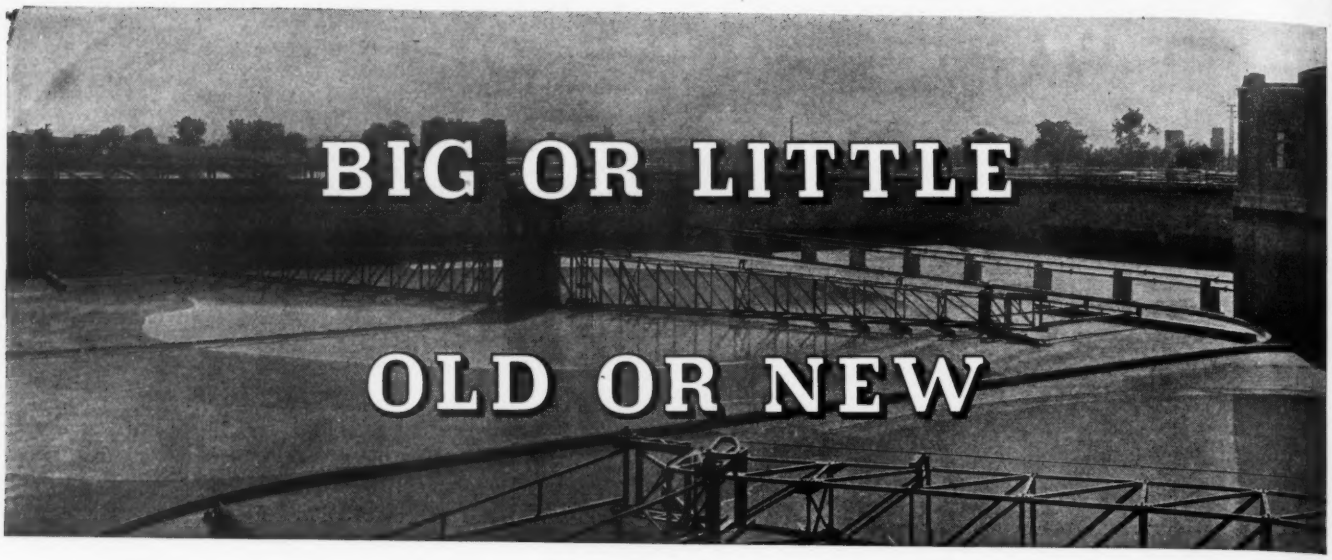
Advance Approval of Utility Connections

Advance approval of limited utility connections for construction or remodeling projects permitted under L-41 is granted in Supplemental Utilities Order U-1-d just issued by WPB.

To qualify for such automatic approval, material for an electric, gas, or water connection must cost less than $1500 in case of underground connection or $500 in the case of other construction. In addition, in the case of an industrial or commercial consumer, not more than 60 pounds of copper may be used in an electrical connection or 250 pounds of iron and steel for gas or water service.

In the case of domestic consumers, the material cost limitation is the same as industrial or commercial while the amount of material must be held within the limits established by the Housing Utility Standards issued by WPB.

Previously such connections were granted upon individual application to WPB. The change was made because administration of L-41, formerly centered in Washington and New York, has now been placed on a regional basis.



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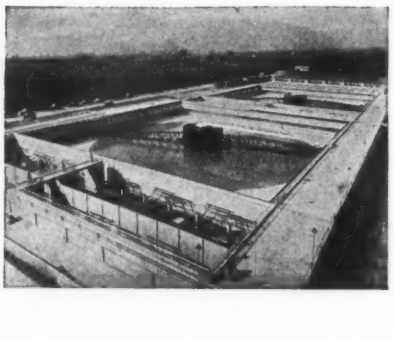


METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

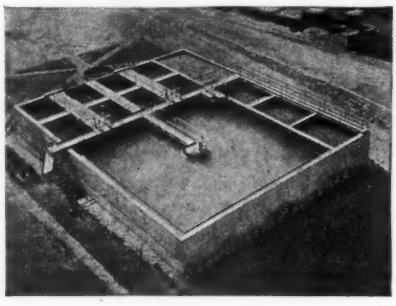
Type: Lime-soda process plus zeolite softeners

Capacity: 100 M.G.D.

Equipment: 2 Dorrco Flash Mixers, 2 Squarex Clarifiers and 2 units of Flocculators

Cons. Engrs.: Hoover and Montgomery, Columbus, Ohio.

SMALL PLANT—NEW CONSTRUCTION



FOLSOM STATE PRISON CALIFORNIA

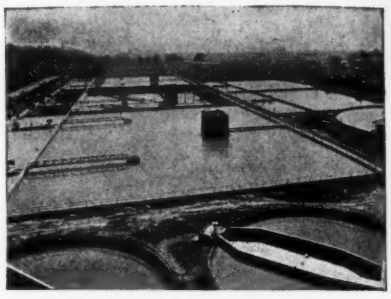
Type: Coagulation

Capacity: 2.0 M.G.D.

Equipment: Dorrco Flash Mixer, Squarex Clarifier and Flocculator

Design: Division of Architecture, Cal. Dept. of Public Works—W. H. Rockingham

BIG PLANT—EXISTING PLAIN TANKS



KANSAS CITY WATER WORKS, KANSAS CITY, MO.

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Cons. Engrs.: Black & Veatch, Kansas City; Burns & McDonnell, Kansas City

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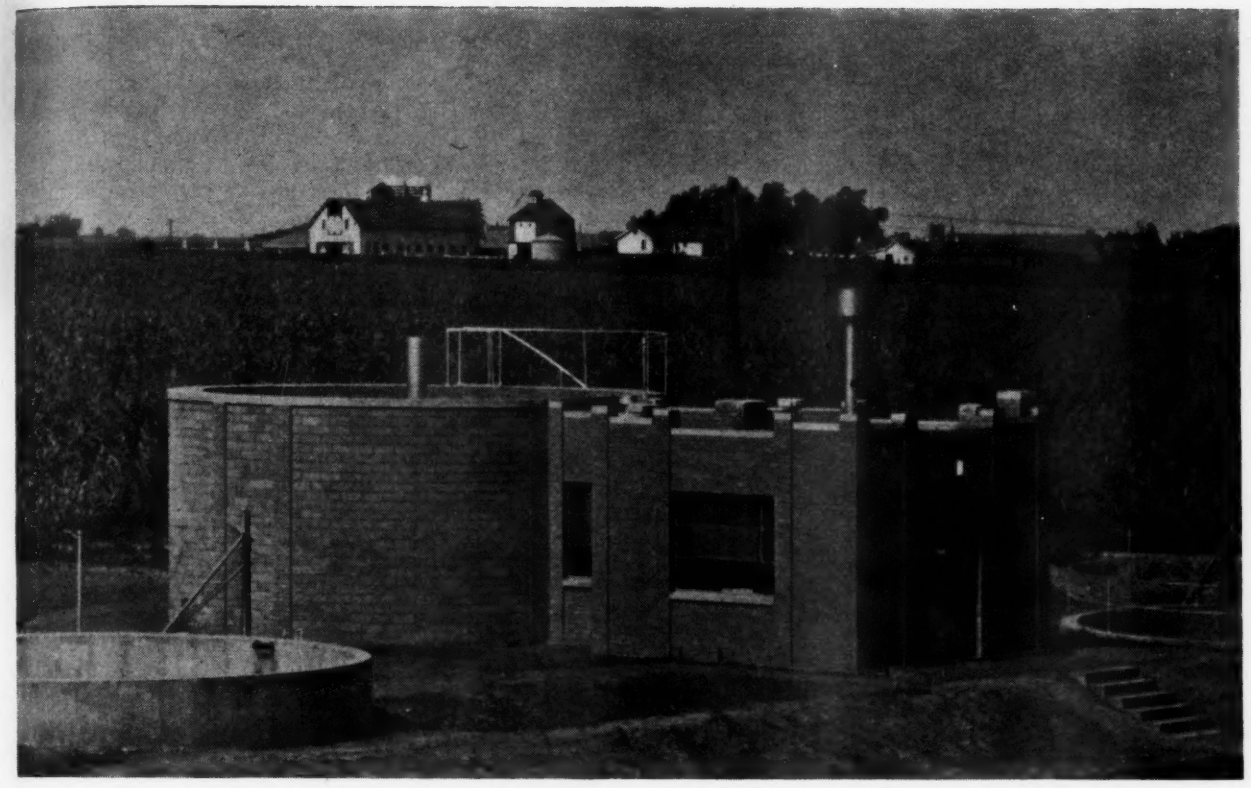

Control building and sludge digester, State Hospital for Epileptics. Institution's dairy farm in background.

Institutional Sewage Treatment and Water Supply

By H. R. GREEN

Howard R. Green Co., Cedar Rapids, Ia.

Designing such plants demands consideration of features that differentiate them from municipal ones. Illustrated by design of plant for an Iowa institution.

THE design of water supply and sewage treatment facilities for institutions offers the sanitary engineer an opportunity for interesting and constructive study, and such study is necessary if the resulting installation is to be at once adequate and economical. Each institution presents its individual problem. Conventional per capita capacity requirements cannot be used. Degrees of treatment and required characteristics of the end product based upon either necessity or economic factors—which would be appropriate in the usual municipal problem—do not apply. Provision for future growth of the institution involves a consideration of long term administrative policies as well as a review of past population trends. Popular pressure favoring or opposing industrial activities within the institution may play an important and possibly unpredictable part.

Population Study: Basic in the design of such a plant is the population study. The population of a public institution bears some percentage relationship to that of the area which it serves. That is, it does at any given time. One might assume therefore that such a ratio applied to a fairly dependable population curve of the district would result in an equally accurate fore-

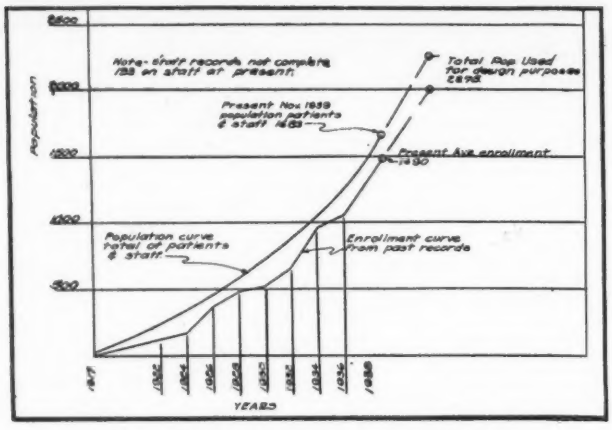
Note: staff records not complete 188 on staff at present
Total Pop Used for design purposes 1893
Present Nov 1939 population patients & staff 1453
Present Ave enrollment 1890
Population curve total of patients & staff
Enrollment curve from past records
Population
YEARS

Fig. 1—Population curve for a hospital.

cast for the institution. But this is not necessarily the case. A multitude of extraneous factors may intrude. Some of them can be recognized and anticipated by the engineer; some possibly not. For example: If the institution is a state hospital for tuberculosis patients, he can determine the probable downward trend of the occurrence of that disease, resulting in a reasonably static hospital population. In other words, the decreasing percentage of the disease frequency tends to offset the predicted increase in population of the district. Likewise, he may determine, probably, in the case of hospitals for the insane or epileptics that the percentage of occurrence is on the increase and the patient population may be dependent upon the capacity of the institution rather than on the population of the contributing territory. If this proves to be the case, a familiarity with the building program of the hospital is necessary.

The population curve shown here (Figure 1) illustrates the point: With the completion of each new housing unit, the population curve has steepened due to the immediate occupancy by patients on a "waiting list." Thus the rate of increase in capacity of the institution, rather than the demand for its facilities, may govern its population rise. Also the maximum economic population of any one institution must be kept in mind: there comes a point when administrative authority determines that a new additional unit at some different location shall be constructed rather than continue the enlargement of the existing one.

On the other hand, in the case of penal institutions it may be found that the tendency has been to maintain a relatively constant ratio as between inmates and area population. An interesting exception in at least one state has been the distinct lowering of the percentage ratio when C.C.C. units went into operation. The number of youths committed for correction is reported to have been reduced sharply.

Per Capita Capacity Considerations. Per capita figures for both water consumption and sewage production and a determination of the daily and hourly peak rates, respectively, of demand or flow, are of necessity important for application to the "design population" curve. Here again conventional municipal assumptions cannot be used blindly. While individual determinations must be made in each case, there are some factors upon which it seems safe to generalize.

In a majority of cases, the per capita water consumption (exclusive of purely industrial uses) will be found to be materially higher than in normal communities of similar population. Instead of the usual small city rate of say 80 gallons per capita per day, 100 g.c.d. is a moderate institutional figure; frequently, double that amount of use is encountered. Those institutions of hospital type or with individual and conveniently located toilet facilities show much greater consumption than those of barracks type with multiple toilets and shower bath installations remote from living quarters. The latter may reduce the daily per capita consumption to 40 or 50 gallons.

Hourly peak consumption is uniformly high from 180% to 225% of daily average rate rather than the conventional 140% to 150% as in small city experience. Obviously, this is due to a regulated daily program. Likewise, the collection rate of sewage from a population concentrated in a restricted area and the relatively short outfall lines offer little opportunity for the timing factor to iron out the extreme peak rates of flow. On the other hand, the capacity which it is necessary to provide for infiltration of ground water is much less per hundred of population due to the larger number of contributing units per mile of sewer. Even this compensating factor, however, usually cannot be relied upon to materially reduce those units of the plant or system, the capacity of which is determined by gallons per minute demand.

Upon a demand curve so constructed must be superimposed the provisions for industrial or occupational consumption; but in institutional cases, such additional load is frequently a beneficial diversity influence, rather than a case of coincident peak.

The effect of these factors upon water supply units is to indicate the necessity, in a gravity type system, of an unusually high volume of elevated storage for finished water. Likewise, if a direct pressure system is used, the surface level clear well and the pumping equipment required may be of unusually large ca-

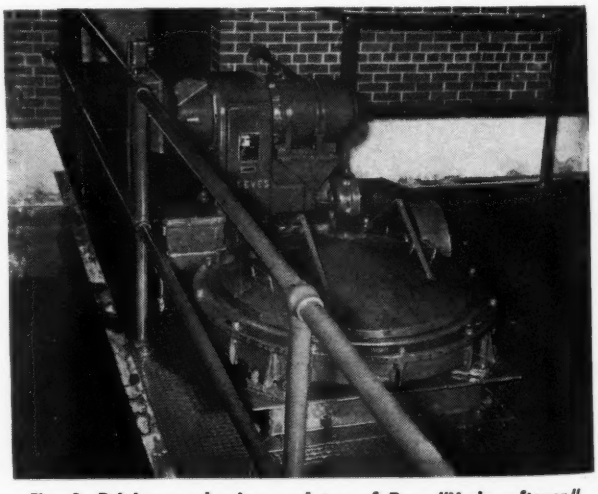

Fig. 3—Driving mechanism and top of Dorr "Hydrosoftener."

pacity. In either case, the distribution system must be enlarged to care for the hourly peaks, unless, of course, fire protection provisions are the controlling factor and automatically furnish adequate pipe diameters.

Degree of Treatment — Considerations. Most institutions of the type being discussed here are constructed and operated by the state. Most states through their Departments of Public Health exert influence upon municipalities, large and small, toward the maintenance of adequate water and sewage treatment plants. If the state is to dictate sanitary policies to its political subdivisions, it should assume the moral obligation of meeting the standard it sets for others as its own minimum requirement and preferably should

TABLE 2 WATER CONSUMPTION DATA

1 Month	Year C	Avr total daily gals water pumpage in N on basis of hours pump operated @ 285 GPM. 3	Thousand gals per day Mar. day of each Month Total Pumpage 4	Thousand gal per day Min day of each Month 5 Total Pumpage	Thousand gal per average day soil Town of Woodward 6	Variation Towns demand % of average month 7	Av. Institions Consumption in thousand gals per day 8 Col 3 Minus 6	Irrigation demand thousand gal. per day Avr. (metered) 9	Estimated boiler feed, dairy barn etc consumed but not practicing sewage TOD	Av. Est Q sewage flow column 8 minus 9 & 10 11	Sewage flow in gals per person est on the basis of a population 1937-1350 12 1938-1300 1939-1640	Total water consumption or Institution in gal per cap per day Col 8 ÷ Population
Sept	37	174	206	116	20	85	154	624	124	1354	100	1140
Oct	"	163	173	105	24	101	139	21		1264	94	1025
Nov	"	165	168	128	23	97	142			1296	96	1030
Dec	"	164	166	114	23	97	141			1286	95	1015
Jan	38	160	158	120	27	114	133			1206	81	950
Feb	"	154	154	113	25	105	129			1166	78	915
Mar	"	161	158	120	23	97	138			1256	84	970
Apr	"	164	169	108	23	97	141			1286	86	985
May	"	175	199	120	22	93	153			1406	94	1055
June	"	184	185	120	23	97	161	411		1445	97	1100
July	"	189	276	121	26	110	163	735		1472	98	1135
Aug	"	192	218	127	25	105	167	437		1502	100	1125
Ave	"	170.75	186.16	117.66	23.66		147.08			1328.2		
Sept	"	202	311	113	29	148	173	1.97		1386	105	1150
Oct	"	186	210	132	26	134	160			1476	108	1055
Nov	"	172	193	120	19	97	153			1406	98	1005
Dec	"	179	200	120	16	82	163			1506	94	1060
Jan	39	177	175	123	16	82	161			1486	100	1040
Feb	"	178	193	126	17	87	161			1486	90	1030
Mar	"	164	170	116	18	92	146			1336	90	950
Apr	"	171	190	118	21	108	150	409		1335	82	845
May	"	210	225	154	23	118	187	1564		1590	82	1170
June	"	196	270	141	17	87	179	564		1630	97	1110
July	"	203	285	120	18	92	185	437		1680	103	1140
Aug	"	196	221	131	19	97	177	70		1640	100	1080
Ave.	"	186.16	221.08	126.16	19.91		166.25			1513.0		

Fig. 2—Water consumption data for two years. Hospital at Woodward, Iowa.

exceed that minimum. Thus, it appears incumbent upon boards and commissions and the engineers advising them, to design and operate such installations with unusual care. As an example, in hospitals or institutions housing patients suffering from communicable diseases, adequate sterilization of final sewage plant effluent may be indicated in addition to the usual clarification and BOD reduction operations. Or in the case of water treatment plants, if there is demonstrable economy in softening of the water supply, that policy should be adopted. The trend of past policy in such matters, as indicated in numerous cases, shows a tendency for the states to follow, rather than to lead, in the program of sanitary improvement, so far as its own installations are concerned.

Illustrative Example of Water Supply and Sewage Treatment for a State Institution

The Hospital for Epileptics and School for Feeble-Minded of the State of Iowa is located adjacent to the town of Woodward. It was established in 1917 and a model cottage type of residence was adopted. The institution occupies some 2000 acres, houses 1500 patients (usual waiting list 250) and a staff approximating 200. Occupational activities for those patients available for such employment include truck gardening, kitchen and laundry operation, utility and building maintenance, dairy farm and general agriculture. The campus is located on a high plain some 200′ above the level of the Des Moines River, which stream is 12,000′ distant.

Water Supply. The water supply is secured by the infiltration of Des Moines River water through a porous sand and gravel stratum to a series of wells, approximately 30′ deep. Three of the wells are of gravel-packed type and one is a dug well 15′ in diameter. The concrete cylinder of this dug well is equipped with a series of entrance ports located opposite the water-bearing formation and the ports are filled and "screened" with gravel graded from coarse to fine particles comparable to the adjacent natural material. Each well is equipped with a motor-driven turbine type pump, three being designed for 150 g.p.m. and the fourth for 360 g.p.m. These pumps operate against a static lift of 27′ and discharge into a covered raw-water receiving reservoir of 114,000 gallons capacity. Adjacent to this reservoir is a pumping station equipped with two 6-stage and one 2-stage centrifugal pumps driven by 50 and 40 h.p. motors, respectively, and rated at 250 g.p.m. against a total dynamic head of 354′. This equipment was in place at the time that the project described here was undertaken and tests of the equipment indicated that the most economical procurable delivery rate was 350

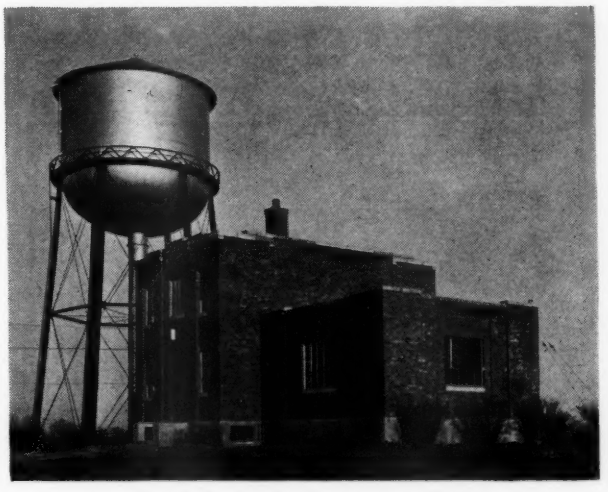

Fig. 4—Boiler plant and water tank.

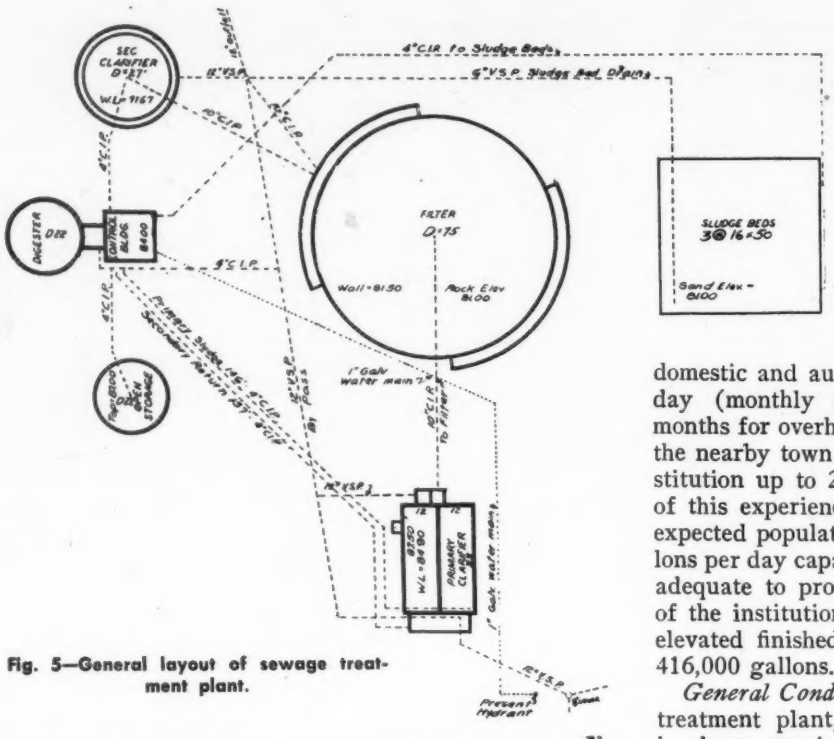

Fig. 5—General layout of sewage treatment plant.

g.p.m., using two units simultaneously. The raw water showed the following analysis. Note that the total hardness is indicated at 22.8 grains per gallon and iron at 1.2 p.p.m.

	Parts per Million	*Gr. per Gal.*
Physical:		
Suspended matter	8.0	
Turbidity	8.0	
Color (apparent as received)	*S1	Yellow
Color (filtered through paper)	8.0	
Odor	None	
Chemical:		
Calcium (Ca)	103	
Magnesium (Mg)	30	
Sodium (Na)	12	
Alkalinity (as CO_2)	163	
Sulfate (SO_4)	115	
Chloride (Cl)	10	
Nitrate (NO_3)	n.d.	
Iron (Fe)	1.2	
Manganese (Mn)	n.d.	
Silica (SiO_2)	23	
Fluorine (F)	0.4	
Free carbon dioxide	32	
Hydrogen sulfide	n.d.	
Mineral acidity (as $CaCO_3$)	0.0	
Oxygen consumed	n.d.	
pH	7.0	
Hypothetical Combinations		
Calcium carbonate	257	
Calcium sulfate	0.0	
Calcium chloride	0.0	
Magnesium carbonate	13	
Magnesium sulfate	131	
Magnesium chloride	0.0	
Sodium carbonate	0.0	
Sodium sulfate	16	
Sodium chloride	16	
Iron oxide (unfiltered)	1.7	
Iron oxide (filtered through paper)	n.d.	
Silica	23	
Total dissolved solids	458	27.5
Alkalinity (P) as $CaCo_3$	0.0	0.0
Alkalinity (M) as $CaCo_3$	272	16.3
Total hardness as $CaCo_3$	381	22.8
Calcium hardness as $CaCo_3$	257	15.4
Magnesium hardness as $CaCo_3$	124	7.4
Non-carbonate solids as $CaCo_3$	134	8.0
Total solids as $CaCo_3$	408	24.4
Mineral acidity as $CaCo_3$	0.0	0.0
Total sodium salts	32	1.9

Capacity of Plant: Reference to the population curve, Figure I, indicates that the plant was to be designed for a population of patients and staff of 2275. This was based on the present plan to abandon further enlargement of the institution when that figure has been reached. Figure II displays the experience table upon which future capacity requirements were predicted. Note that in addition to domestic and auxiliary uses, up to 15,000 gallons per day (monthly average) are used during summer months for overhead irrigation of truck gardens. Also, the nearby town of Woodward purchases from the institution up to 29,000 gallons per day. On the basis of this experience record, expanded to the maximum expected population, a treatment plant of 500,000 gallons per day capacity was selected on the basis of being adequate to provide the usual predicted daily needs of the institution in a 12-hour operation, there being elevated finished water storage capacity available of 416,000 gallons.

General Conditions. Prior to the construction of the treatment plant, a considerable amount of difficulty has been experienced with the sloughing off of oxidized iron deposits from mains, the staining of porcelain fixtures and acute taste and odor difficulties attributed to crenothrix growths and the reaction therewith of heavy chlorine dosage. In an institution of this character, where hundreds of feeble-minded children are hospitalized, the laundry load is severe. Average daily laundry service amounts to approximately 3 tons on the basis of present population and, as this operation is conducted during 5 days of the week, the peak laundry load exceeds 4 tons per day. The difficulties and expense of this operation, using water high in iron and hardness, are obvious. Exclusive of the saving

Fig. 6—Plastering conical bottom of final clarifier.

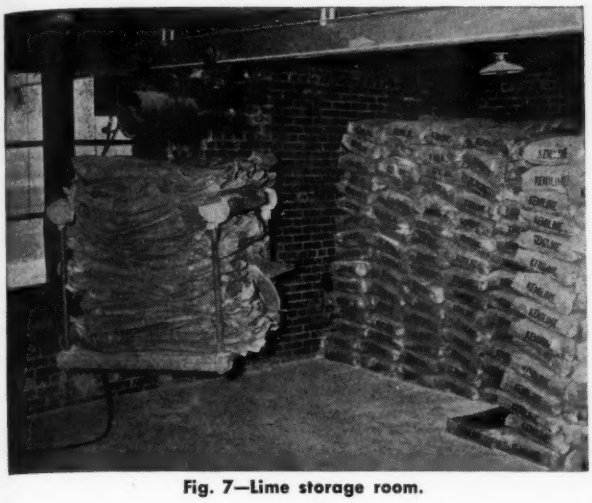

Fig. 7—Lime storage room.

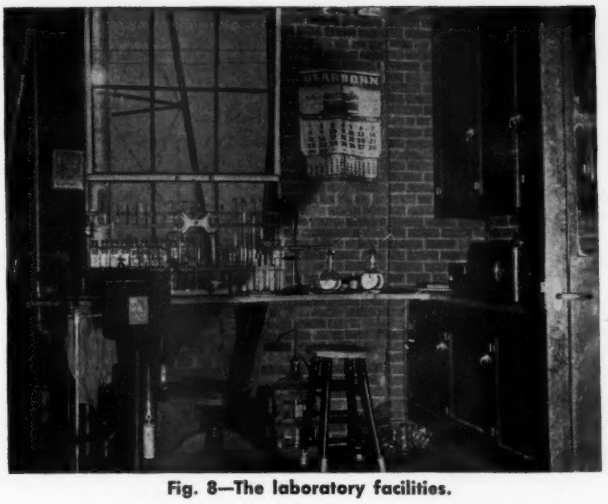

Fig. 8—The laboratory facilities.

effected by lower replacements of bed linens, sufficient economy in soap consumption was apparent to warrant the construction of a plant which would reduce the hardness to 5 or 6 grains per gallon, inasmuch as filtration for iron removal would be necessary in any event. The distribution system was so designed that it was possible to segregate the irrigation lines from the balance of the system and to service that section during the summer months with untreated raw water. Excess lime plus recarbonation was the type of treatment selected. Provision was made for soda ash and alum dosage, and Zeolite softeners to follow up this treatment were found economically justifiable for the laundry and heating plant.

The plant may be bypassed in case of any extended interruption of service. Under normal operation, the water is prechlorinated at the river pumping station to provide contact time during two miles of travel before reaching the treatment plant.

Description of Water Plant. Upon entering the plant, the water is delivered through a raw-water rate-of-flow controller to a coke tray aerator enclosed in a steel drum. This unit is served by a vacuum pump and a throttling air inlet valve. Sufficient atmosphere is admitted to oxidize the iron, but the pressure within the unit is kept materially below atmospheric pressure as a means of reducing dissolving gases (CO_2 and dissolved oxygen) for the dual purpose of economizing in the use of lime and for the reduction of aggressiveness of the finished water.

From the aerator, the water proceeds by gravity through a seal which protects the partial vacuum within the last-named unit to the induction pipe of a Dorr hydro-softener. This unit is installed in a square concrete tank with concrete fillets in the corners to adapt it to the circular sweep of the machine. Raw water is introduced at the bottom of the tank through a rotating pipe arm equipped with orifices and supporting mixing vanes. Lime and soda ash solutions are introduced by gravity from the mixing and feeding mechanism located on the upper or chemical storage floor of the adjacent section of the building. Clarified, softened water flows by gravity from a collecting launder to the recarbonation chamber. This latter unit is equipped with over-and-under type baffles and a gridwork of perforated pipe through which the CO_2 is introduced.

Following recarbonation, gravity carries the water to a pair of filter cells and from there, after final chlorination, to a clear water well built at lowest level in the main portion of the building. The filters are served by individual rate-of-flow controllers and hydraulic valves and by conventional type operating tables. Adequate laboratory facilities are located at one end of the operating room. The lime storage room provides storage for two carloads of lime and soda ash and is located at a staggered elevation with relation to the mixing and dosing equipment for convenience in changing the latter. To avoid the construction cost of an elevator shaft, double exterior doors and an overhead tram rail with motor hoist-lifted skip provide for delivery of the lime from trucks to storage. In the pipe gallery room opposite the location of the automatic centrifugal pumps (which deliver water from the clear well to the nearby elevated storage tanks) is located the CO_2 equipment, including oil burner, scrubber, purifier and compressor.

General. The legislative appropriation for this plant was $40,000. The production of a unit which would process one-half million gallons per day under the conditions described required a very compact unit. This was accomplished by designing to utilize exterior walls wherever possible, for the dual purpose of housing hydraulic units and supporting the superstructure, but no necessary or desirable equipment was eliminated. No heating plant was necessary except for the installation of unit heaters serviced by steam from the adjacent boiler plant of the institution. Lime sludge is discharged into an adjacent ravine by gravity.

Sewage Treatment Plant. At the time this project was undertaken, the institution was served by an Imhoff tank of inadequate size and in bad repair. This unit was followed by a pair of conventional type of intermittent sand filters, and the effluent was discharged into a nearby dry ravine which traversed some two miles of land used for the pasturing of dairy cows. The new installation had to be located at the same site and to be constructed without interrupting the operation of the Imhoff tank. It is a more or less conventional "clarifier plus trickling filter" type of installation with separate, heated sludge digestion.

The raw sewage reaches the plant site through two flat-grade outfall sewers. A mechanically raked bar screen housed in a sheet metal enclosure is mounted at one end of a grit channel having steeply sloped bottom slabs leading to a continuous installation of removable rectangular grit cans equipped with extension handles reaching waist high to the operator's platform for quick and easy emptying. Grit removal is followed by passage in parallel through a pair of primary clarifiers. These units are mechanically cleaned

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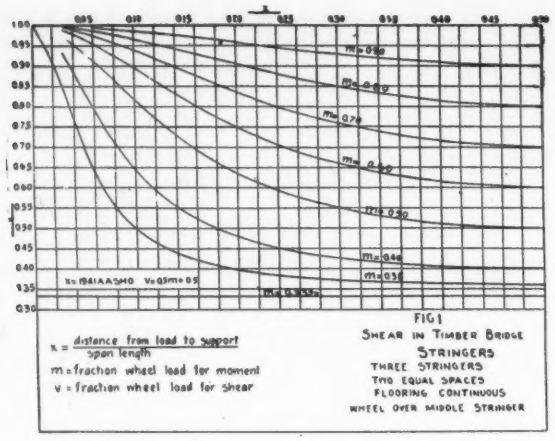

x = distance from load to support / span length
m = fraction wheel load for moment
v = fraction wheel load for shear
FIG 1
SHEAR IN TIMBER BRIDGE STRINGERS
THREE STRINGERS
TWO EQUAL SPACES
FLOORING CONTINUOUS
WHEEL OVER MIDDLE STRINGER

Wheel Load Distributi r Sh

By CLIFFORD JOHNSON
Bridge Engineer, North Dakota State Highway Department

THE principal difficulty in computing shear stresses in timber bridge stringers consists in determining the fraction of wheel load carried by the stringer directly under the load. The critical position of a concentrated load to induce maximum shear stresses in a timber beam has been carefully investigated by the U. S. Forest Products Laboratory. As a result, the proper position of the load on a timber beam for maximum shear is well established for cases where the total load is carried by a single beam (with no distribution of any portion of that load to adjacent beams). In assemblies such as a highway bridge deck, a considerable portion of the wheel load is distributed from the stringer directly under the load to adjacent or parallel stringers by the floor, whether the wheel is in position for maximum shear or moment.

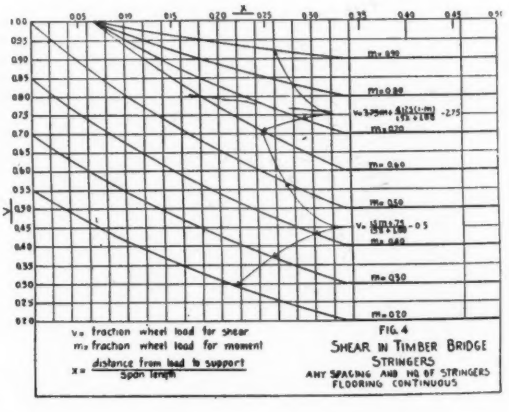
Rules for determining the percentage of the load to use in calculating shear in timber stringers are not well established, however. Specifications usually fix the position of the wheel load in the span for computing shear, and occasionally suggest the percentage of load to be carried by the stringer directly under the load. Formulas heretofore suggested for determining such values generally give higher percentages of the load than are actually carried by the stringer under consideration, and in the majority of cases make shear, rather than bending moment, the controlling factor in designing new bridges and in rating existing bridges, even of fairly long spans. Frequently this requires stringers of considerably larger size than are known to be necessary for the particular case at hand and, in cases of structures in service, severely impairs their rating. Also, some of the formulas suggested for determining the percentage of the load to use in calculating shear are based on the quarter point of the span as the critical position of the load. The critical position, three times the depth of stringer from the support, determined by the U. S. Forest Products Laboratory, has varied in our timber stringer designs from 18 to 27 per cent of the span for H-15 loading and from 23 to 32 per cent for H-20 loading. Hence, rational formulas for determining the fraction of wheel load to use in calculating shear in timber bridge stringers must take into account the critical position of the load in the span as well as the spacing of the stringers.

An attempt at the development of such formulas is set forth below:

L = span length of stringer.
W = wheel load.
m = fraction of wheel load carried by the stringer directly under the load when the load is at the center of the span; in other words, the fraction of wheel load used in computing moment.
v = fraction of wheel load carried by the stringer directly under the load when the load is at a distance xL from the support.
d = deflection at center of stringer when full wheel load is applied at center.
r = ratio of deflection of stringer at a load point at a distance xL from the support to deflection at center of stringer when the same load is applied at the center $= 16x^2 (1 - x)^2$.

Referring to the load diagram for three equally spaced stringers, A, B, and C with flooring continuous from A to C.

When the wheel load is at h:
The load carried by stringer B is Wm,
The load carried by each stringer A and C is $\frac{W(1-m)}{2}$,

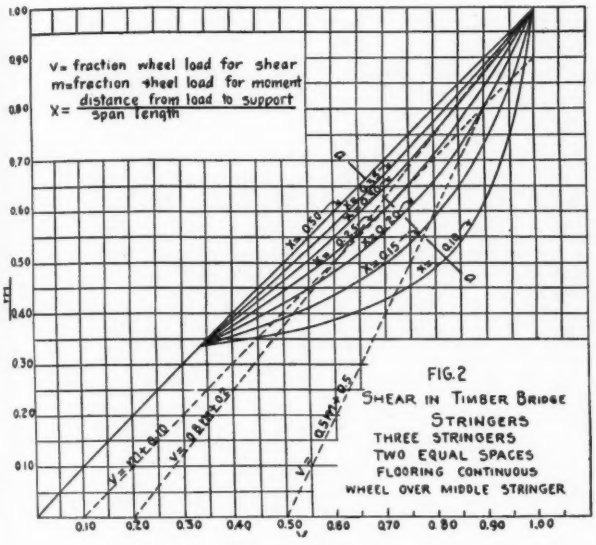

v = fraction wheel load for shear
m = fraction wheel load for moment
x = distance from load to support / span length
FIG. 4
SHEAR IN TIMBER BRIDGE STRINGERS
ANY SPACING AND NO. OF STRINGERS
FLOORING CONTINUOUS

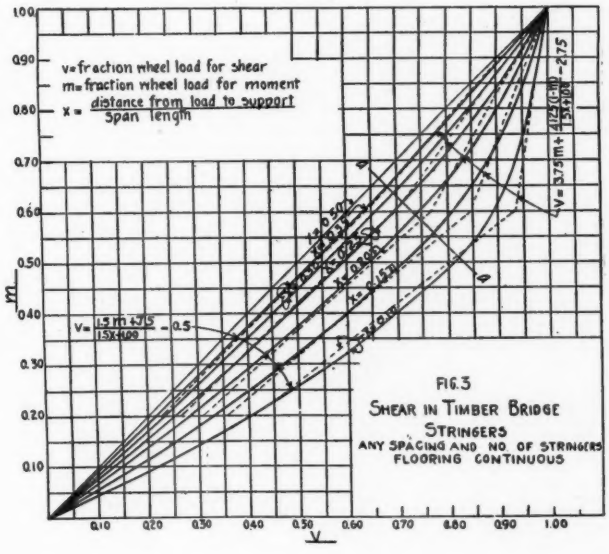
The load carried by the flooring from h to g and i is $W(1-m)$,
The deflection of stringer B at h is dm,
The deflection of stringers A and C at g and i, respectively, is $\frac{d(1-m)}{2}$,

1941 A.A.S.H.O. specification formula ($v = 0.5m + 0.5$); the formula ($v = 0.8m + 0.2$) proposed by W. D. Keeney in the June 1941 issue of WOOD PRESERVING NEWS; and the formula $v = m + 0.1$. We have used the equation $v = m + 0.1$ in some of our designs and bridge ratings, but it is not applicable over a wide enough range of stringer spacings and load positions for the general case (any spacing and number of stringers and any position of load).

r Shear In Timber Bridge Stringers*

Rational formulas for determining wheel load distribution, based on investigation made by the U. S. Forest Products Laboratory.


v= fraction wheel load for shear
m=fraction wheel load for moment
X= distance from load to support / span length
FIG.2
SHEAR IN TIMBER BRIDGE STRINGERS
THREE STRINGERS
TWO EQUAL SPACES
FLOORING CONTINUOUS
WHEEL OVER MIDDLE STRINGER


v=fraction wheel load for shear
m=fraction wheel load for moment
x = distance from load to support / span length
FIG.3
SHEAR IN TIMBER BRIDGE STRINGERS
ANY SPACING AND NO OF STRINGERS
FLOORING CONTINUOUS

While the above solution for v is theoretically exact for the case considered its limitations are obvious from the limitations of the original premises. Only three stringers are considered, a case rarely if ever encountered in highway bridges. Inasmuch as the effect of additional stringers decreases as the spacing increases, the values of v obtained from the equation are probably nearly correct for any number of stringers when m is more than 0.45 or 0.50, and become more and more incorrect as m decreases toward 0.333. In the case considered m cannot be less than 0.333 for if it were, stringers A and C would each carry more of the wheel load at h than stringer B. Hence, when m is less than 0.333 the values of v obtained from the equation are not rational.

Presumably, exact theoretical equations based on relative deflections could also be derived for the general case but they would be rather complex for practical use and would have to be based on certain assumptions which would hardly warrant their complexity.

For the general case it seems reasonable to assume that above the line *a-a* (midpoints) the curves in Fig. 2 are satisfactory as they are, and that below the line *a-a* they should be similar in shape to those in Fig. 2, but obviously their lengths should be increased so that their lower common point will be at $m = o$ and $v = o$ instead of at $m = 0.333$ and $v = 0.333$. Such curves are plotted in full lines in Fig. 3. Above the line *a-a* they are the same as in Fig. 2 and below the line *a-a* each point is twice the distance from the line *a-a* but the same distance from the line $x = 0.50$ as in Fig. 2.

These curves can be replaced by the following formulas with such slight differences in results that the formulas are recommended for use with the limitation that v shall in no case be less than m (when x is more than 0.333 the formulas make v less than m).

For values of m from 0.20 to 0.60

$$V = \frac{1.5m + 0.75}{1.5x + 1.00} - 0.50$$

For values of m from 0.60 to 1.00

$$V = 3.75m + \frac{4.125\ (1 - m)}{1.5x + 1.00} - 2.75$$

These equations appear rather cumbersome but they are quite easy to graph. For each value of x the former is a straight line from $m = -0.50$ and $v = -0.50$ to $m = 0.60$ and $v = \frac{1.65}{1.5x + 1.00} - 0.50$ and

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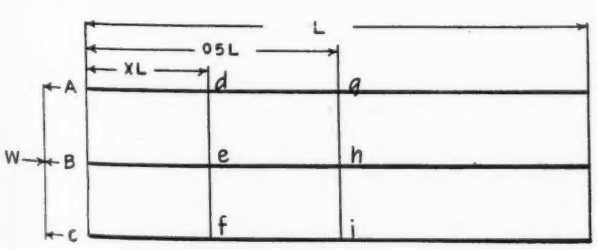
*From "Wood Preserving News."



Load diagram, three equally spaced stringers.

Lewiston, Idaho, Water Department Saves Mone

New pumps installed in 1942 not only increase capacity but, because of higher efficiency, save $5.77 per million gallons in cost of power.

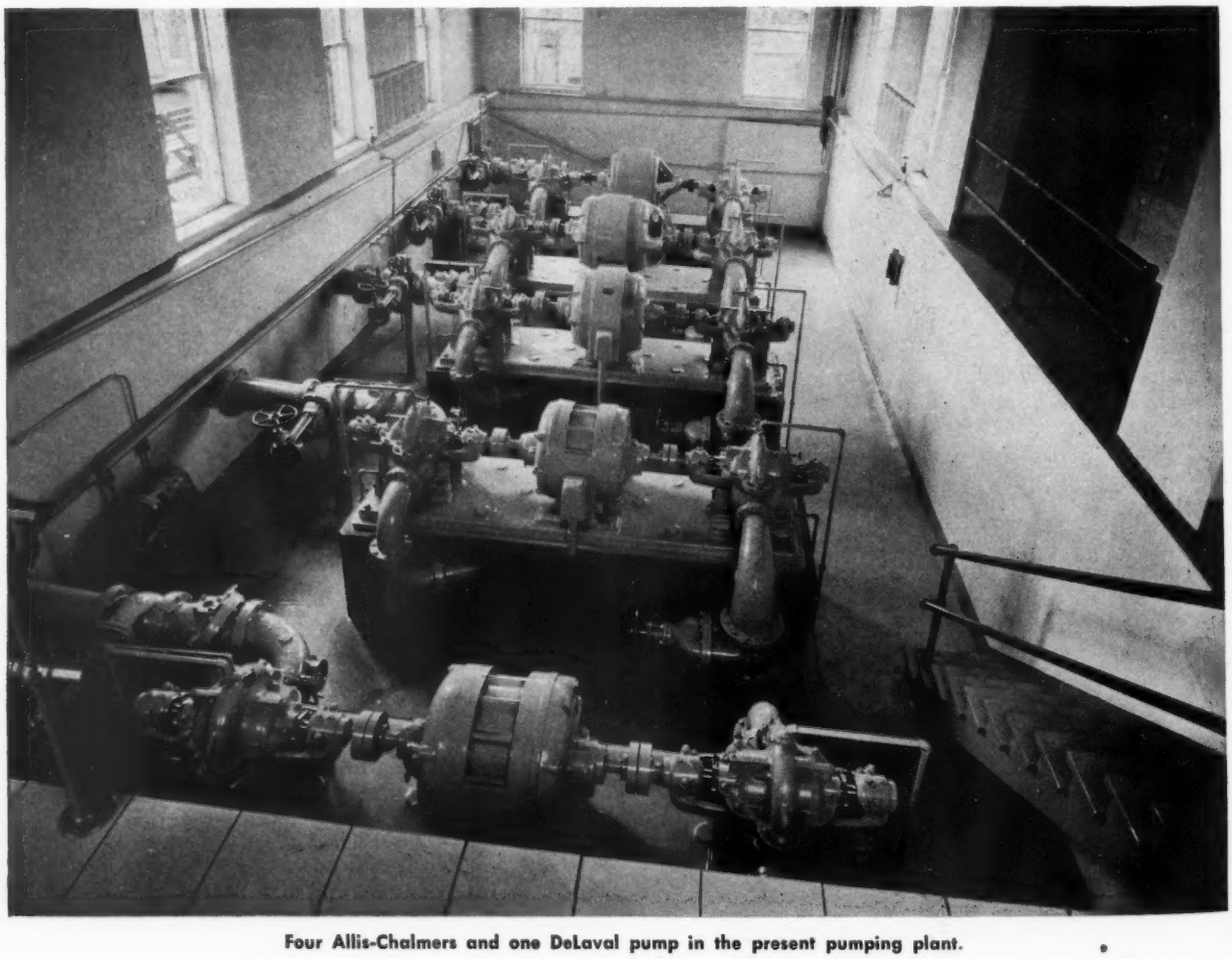
THE history of Lewiston's first pumping equipment goes back to the romantic era of river steamboats, stagecoaches and quick riches in Idaho gold fields. The water was pumped directly from the Clearwater river to a reservoir on the hill. During several months of the year the water carried a high percentage of turbidity consisting of mud and organic matter heavy with pollution, which necessitated scouring bathtubs, basins and receptacles after use; however, the pioneers were a hardy race and, aside from a few cases of typhoid, they had what they thought was a luxury, especially after buying water for 25 cents a barrel, as was the system before.

Some years later an electrically driven plunger pump with big, heavy gears was used in what is now the raw water pump room. This pump could be heard for some distance around. A little later, the intake lines were changed and a baffled grit chamber installed to remove the sand. This was considered a big improvement and undoubtedly was. This grit chamber is still used in connection with the plant, but the suction lines out into the river are not the same.

The geared plunger pumps were finally discarded and in about 1912 a Platt Iron Works direct connected, electrically driven, turbine pump installed. This pump was large and gave steady service until recently, when it was replaced by Allis-Chalmers equipment.

In about 1916 two Byron Jackson pumps were installed to take care of increased water demands. These pumps had a capacity of 1500 gallons per minute.

In 1924 the Burns & McDonnell Company was engaged by the city as engineering consultant to redesign the pumping installations and design a new modern filtration plant. As a result of their studies, a DeLaval two-stage centrifugal 8-inch pump directly

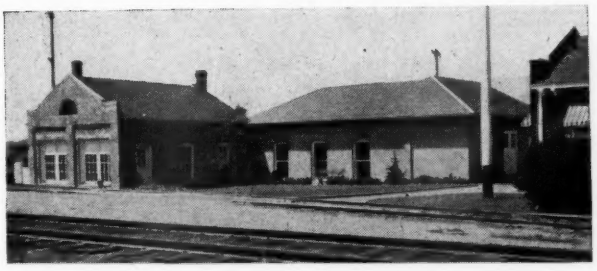


Four Allis-Chalmers and one DeLaval pump in the present pumping plant.

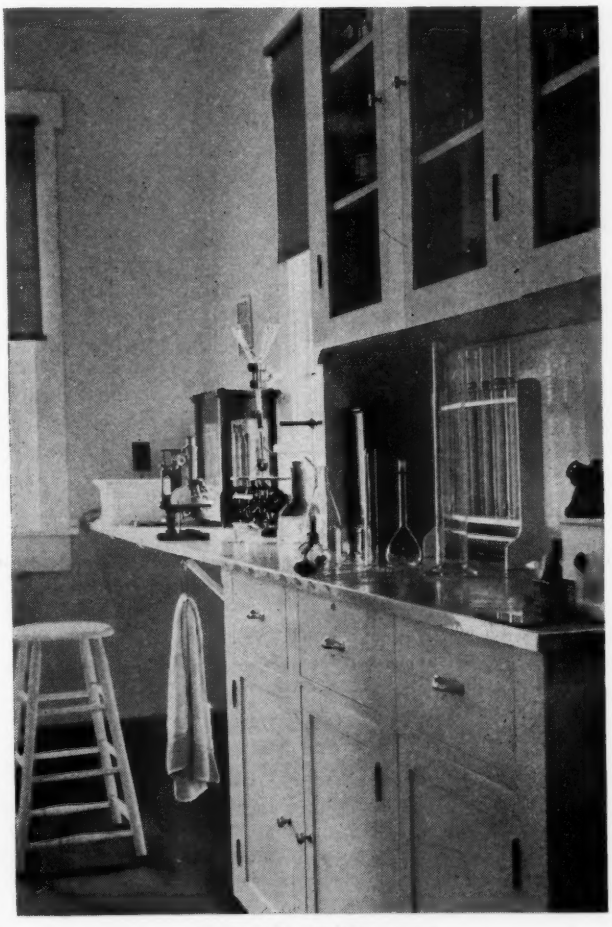
Modernizing Equipment

By W. P. HUGHES
City Engineer of Lewiston, Idaho

The switchboard viewed from across the pump room and above the pumps.



The raw water, high and low service pumping stations.



North side of laboratory.

connected to a 300 h. p. General Electric motor of 2100 g.p.m. rated capacity was added to the above equipment which at the time of our 1942 improvement consisted of the following:

One 10-inch Platt Iron Works centrifugal pump with a rated capacity of 2800 gallons connected to a G. E. 450 h. p. motor.

One DeLaval, two-stage centrifugal 8-inch pump directly connected to a 300 h. p. General Electric motor with a capacity of 2100 g.p.m.

Two 10-inch Byron Jackson centrifugal pumps with a rated capacity of 1600 g.p.m. connected to 150 h. p. motors.

New Equipment

The high-service system, which supplies the residential district, now has three pumps: 1—The DeLaval pump mentioned above, which has been reset in a different position and equipped with new starting mechanism. 2—A new Allis-Chalmers unit, powered with a 300 h. p. slip-ring variable-speed motor which will pump from 1200 g.p.m. to 2100 g.p.m. At the rated head and capacity, the pump efficiency is 82½%, the motor efficiency at full load 94.5%. The power factor is 92.5% at full load. 3—The other new unit to the high service, which will lift 1050 g.p.m. The full load efficiency for the pump is 77% and for the motor 93.5%. The power factor is 89.5%.

The low service, which supplies the business district, has two Allis-Chalmers pumps with a rated capacity of 1050 g.p.m. The pump efficiency is 83% and the motor 90.6%. The power factor is 89%.

The new modern control panel is well equipped and is a G. E. cubicle type. The incoming line panel has an ammeter with 200 ampere scale, one 3-phase ammeter switch, one volt-meter with 3-phase switch, two induction type time over current relays with provision for AC trip, and one oil circuit breaker. The two panels for the 300 h. p. slip-ring motors have ammeters, over current time delay trip coils, manual operating mechanism controlling magnetic switches for starting, and oil circuit breaker. The other panels all have ammeters and breakers.

The measuring equipment to the high-service system now consists of a 16x9½-inch Venturi tube. A Bailey synchro-type transmitter, located in the furnace room, is connected to this and electrically controls a recording receiver in the office. This receiver records the rate of flow throughout the day and the total water pumped. A flow indicator, operated by the same transmitter, is located in the pump room near the control panel and enables the operator, when using the variable speed pump at less than full capacity, to see how much it is pumping and make the desired adjustment.

Installation Problems

The most difficult problem presented in making the change to new equipment was, of course, to continue operating and supplying water while at the same time tearing up the suction lines, removing the old pumps to make room for the new and making excavation for the addition to the pump room with the end of the room torn out during the construction period.

(Continued on page 38)

Wartime Sewerage "Musts" and "Can'ts"

Excerpts from a speech before the New Jersey Sewage Works Association by Maury Maverick, Director, Governmental Division, WPB.

AS Director of the Governmental Division of the War Production Board and in recognition of the intimate relationship which exists between sanitation and public health, I recently invited qualified representatives in your field to meet with me to discuss all phases of the sanitation problem. They were: Linn H. Enslow, Chairman of the Sanitary Engineering Division of the American Society of Civil Engineers; William Raisch, Chairman of the Process Industries Division and Sanitation Group of the American Society of Mechanical Engineers; and George J. Schroepfer, President of the Federation of Sewage Works Associations. This professional advice was sought and accepted by me on behalf of the War Production Board.

Right now my Division is receiving from fifty to a hundred applications a day for approval of all kinds of projects. Concerning sewer projects, they ranged a day or two ago from a little one of $1,300 to another for $1,400,000. Many more of larger amounts are, of course, received.

Last year, even with the necessary curtailment of work, some 43 million dollars were expended for this purpose in the United States. Under normal peacetime conditions, this amount would, of course, have been far greater. The difference between what *was* spent and what *would* have been spent represents projects which are now accumulated on the shelf, awaiting the end of hostilities.

I do not hazard a guess on how much construction of municipal sewage treatment plants can be approved in 1943. However, with $43,000,000 spent last year, competent authorities claim that it will be necessary to spend $73,000,000 in 1943.

Concerning the large amount of systems which it now appears necessary to construct, it is established that for the duration of the war that we can approve only limited projects which are directly connected with the war effort, as for example, those sponsored by the Federal Works Agency where either extensions of existing systems or the building of new systems are made necessary because of the heavy influx of war workers into munition and armament centers. Also, it seems we must find a way for getting materials for work that cannot be deferred without endangering the health and welfare of the people.

This means, however, that disposal plants cannot be advanced at the present unless, for instance, it can be shown that the sewage contaminates the river which is used as a source of water supply further downstream. Even then, it is a question whether the disposal plant should be built or whether additional facilities should be installed in the water purification plant to remove the impurities introduced by the distribution of untreated sewage into the stream. Whichever of the two plans involves the least amount of critical materials is the one most likely to be approved.

Naturally, you can understand that it is no simple matter to evaluate the variety of needs. In many cases, substitutions have had to be made in the construction of sewerage systems and disposal plants. Where concrete can be used instead of steel and iron, it has been done. The Governmental Division has been allotted a comparatively small quantity of iron and steel available for use where absolutely essential. Approval, therefore, must be restricted to cases of the most urgent needs.

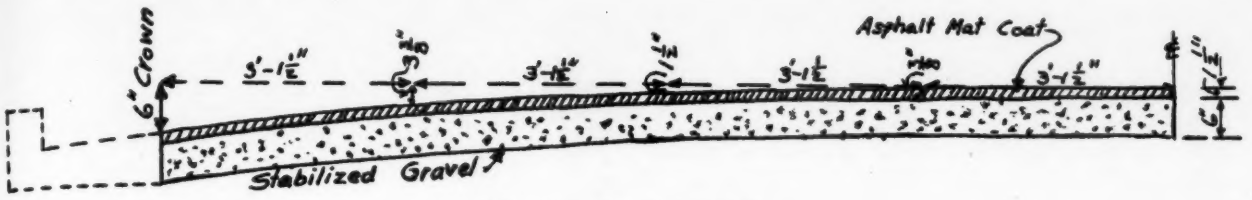
So-called complete treatment is practically out for the duration and instead, partial or primary treatment will have to suffice.

Following the recommendations of the Raisch-Schroepfer-Enslow Committee, we will set up a new Section in the Governmental Division to deal exclusively with Sewerage and Sanitation problems. This new section will be administered by a man of proven ability in this field. I am sure that this will go far in clarifying the priorities situation.

Do not hesitate to forward your requirements to us, whether they are for new construction or for maintenance and operating supplies. In so doing, you will gain authoritative advice on your problems, and, in addition, your requirements will be listed in our files pending action during the transition period following the end of military hostilities. This may help you in expediting your work when that time comes and we all hope it may be very soon.

Garbage Disposal in Army Camps in Kentucky

Garbage disposal has become an increasingly serious problem in connection with military concentrations. In 1939, the State Board of Health adopted a regulation requiring that all garbage fed to hogs be heated to at least 212 degrees F. and held at that temperature for 30 minutes, in apparatus and according to methods approved by the local health officer. Garbage contracts let by the Army at Fort Knox, Bowman Field and Camp Breckinridge specifically stipulate that the provisions of this regulation must be met. The contractor handling the Bowman Field garbage is complying with the regulation. At Fort Knox, the contract was split among three bidders. Two of them are complying with the regulation; it is doubtful that the third is making any attempt to cook the garbage. At Camp Breckinridge, no cooking is being done because the contractor is unable to obtain the necessary material for putting the cooker in operation. This garbage-feeding farm is located on the edge of the Trade Water river, approximately one mile from the intake of the Sturgis water plant, which will supply water to the Air Support Command Base near that town. At Camp Campbell, garbage from the cantonment area is hauled into Tennessee, which has no State regulations requiring cooking of garbage, and fed raw to hogs. Under such conditions, a decided increase in the incidence of trichinosis in these areas would not be at all surprising. —*From Bulletin of Kentucky Department of Health.*



Half cross-section of pavement.

Street Improvements in Webster City, Iowa

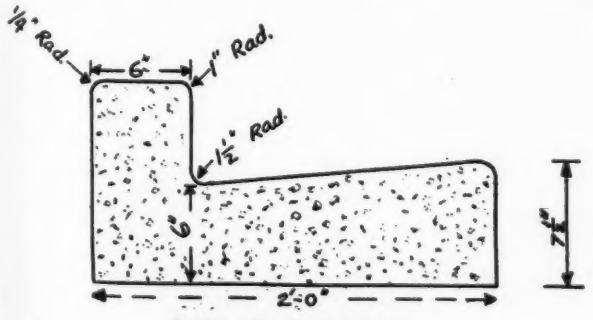
By H. A. LITTLE
City Engineer of Webster City, Iowa

How a plant-mix asphalt wearing course on a stabilized gravel base was laid on that city's streets at a cost of $1.20 a square yard, including excavation, engineering, etc.

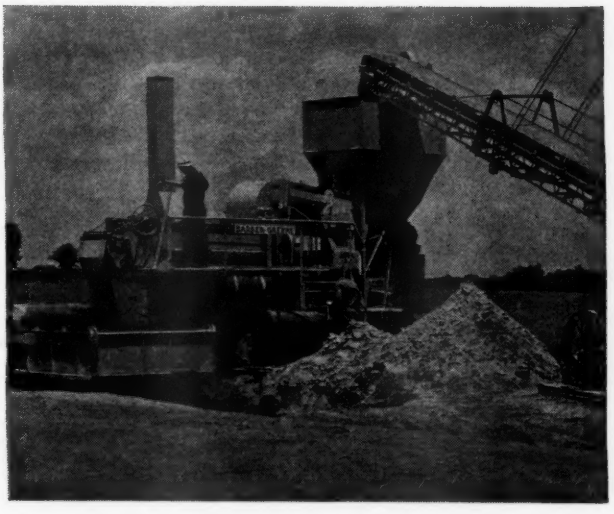
LIKE most towns, Webster City, a town of 7,000 population in north central Iowa, has many outlying streets surfaced only with inferior material; in this case, loose gravel or cinders. While this is an improvement over the natural soil, it is more or less soft and sticky in wet weather and very dusty when dry, and many property owners have wanted pavement. But they have been unwilling to assume the high cost of such types as have previously been built in the community, those being brick on concrete base, asphalt mat on concrete base, and reinforced concrete.

The city administration assured the property owners that a durable pavement could be constructed at a cost to them of approximately one dollar per front foot, and in the spring of 1941 petitions signed by a majority of the property owners in twenty-one blocks were presented to the city council asking for the construction of such a pavement, payment therefor to be spread over a period of ten years. Accordingly plans and specifications were prepared for two types of stabilized base and asphalt wearing surface, and in August 1941 a contract was awarded to the Hargrave Construction Co. of Cedar Rapids, Iowa, for laying the twenty-one blocks of surfacing, providing for a stabilized gravel base 6 in. thick after compaction, and a 1½ in. plant-mix asphalt mat wearing course.

A combined curb and gutter had been laid some years previously on all but four of the blocks, and a contract was awarded Rex Swanson, a local contractor, for building plain concrete combined curb and gutter on the remaining four, to be laid in 8-ft. sections separated by ⅛ in. open joints and with ⅜ in. pre-moulded expansion joints every forty feet; this approximately matching the former type of construction.



Section of curb and gutter.



Barber-Greene pug mill.

Excavation for the pavement started in Sept. 1941. The old surface was scarified and bladed into windrows, then loaded into dump trucks with a Barber-Greene loader, after which the sub-grade was rolled with a 10-ton roller and was then ready for the stabilized base material.

The specifications for the base material were for gravel with the following grading by weight:

	Minimum	*Maximum*
Passing 1½" sieve	100%	—
Passing 1.05	85	100%
Passing 0.742	75	100
Passing 0.371	60	95
Passing No. 4	45	85
Passing No. 10	35	70
Passing No. 40	20	35
Passing No. 100	12	28
Passing No. 200	9	22

The fraction passing the No. 200 sieve was to be less than half the fraction passing the No. 40 sieve, and the fraction passing the No. 40 sieve to have a

liquid limit not greater than 25 and a plasticity index between 2 and 6.

No pit-run gravel was available that fulfilled the specification, all being deficient in fine material. Fortunately a pit was found within a reasonable distance that also had a clay deposit of satisfactory material close by, and by adding 10% of this clay a mixture was obtained that gave the desired plasticity index.

The optimum water content was determined by the Proctor test. This test indicated the best mixture to be 10% of clay added to the gravel, with a total moisture content of 9½%, this giving a weight of 132 lbs. per cu. ft. after compaction.

The set-up at the gravel pit was a Barber-Greene cylindrical rotary drier and pug mill. The gravel and clay were admitted to the drier through separate openings, the relative size of which controlled the proportion of each material. In this they were dried and mixed, then passed on to the pug mill, where water was added to give the required percentage. The mixture was then discharged into dump trucks and hauled to the streets.

Application of the base material to the sub-grade was made by means of a "lay down" machine. The material was dumped into this machine, which spread it in a layer about 8 ft. wide and 3 in. thick. As the machine placed the material, it vibrated it into smooth and compact form. Usually one block was placed at a time, three trips being required to cover the width of the street. After one layer had been placed, it was compacted with a pneumatic-tired roller, similar to an ordinary truck but having eight wheels abreast on the rear. These rollers gave excellent compaction, rolling the low spots as well as the high ones, and reducing the thickness of the gravel to about 2 in. Two other layers were then added, each layer as a rule being sprinkled with water before the next was added.

An improvised laboratory was set up at the pit and frequent tests were made with a liquid limit machine to determine whether the plasticity limit was being held between the limits of 2 and 6, as well as tests to observe the actual moisture content in the final mixture. After completion of the base, samples were taken in each block to determine the density of the material in place; a cylindrical section about four inches across was chipped out with a hammer and chisel, and the material removed was dried and weighed. The hole was then filled level full with oil of which the specific gravity had been determined. The amount of oil required to fill the hole was the difference in the weight of the oil container before and after filling the hole. The weight of the oil divided by the specific gravity gave the volume, and this compared with the weight of the material removed permitted a computation of the weight per cu. ft. It was thus found that the actual weight varied from 92% to 107% of the Proctor weight, the majority of samples being over 100%.

After completion of the base, it was given a prime coat of medium-curing cut-back asphalt No. 1 at the rate of about ¼ gal. per sq. yd. and at a temperature of about 155°. This was applied by a tank distributor of about 600 gals. capacity using a 12 ft. spray bar, which enabled it to cover the street in one round trip. The distributor was equipped with a tachometer which could be set to permit application of the asphalt at the desired rate for a given speed of the machine. The base was then ready for the asphalt mat coat.

The mat coat was a mixture of gravel, sand and rapid-curing cut-back asphalt No. 4. The specification for the aggregate was as follows:

Sieve Size	*Percentage by Minimum*	*Weight Passing Maximum*
¾"	100	—
No. 4	65	85
No. 8	50	70
No. 30	30	45
No. 200	0	15

This material was obtained from a different source but it was again necessary to add fine material, about 15% of sand being used which had a plasticity index of 20 or less, and 50% of which passed the No. 200 sieve.

This material was handled by about the same equipment as the base material. It was fed into the Barber-Greene drier in the proper proportions, mixed and dried to contain not over 2% moisture, then passed into the pug mill and about 4½% of asphalt added. The material came out at a temperature of about 175°, and was hauled to the "lay down" machine in dump trucks and spread in the same manner as the base course, the thickness when dumped being about 2½ in. This was then rolled with a 10-ton roller to the required 1½ in. thickness.

A seal coat of rapid-curing asphalt No. 4 was then applied by the distributor at the rate of ¼ gal. per sq. yd. and a temperature of about 260°. On this a blotter coat of 15 lbs. of sand per sq. yd. was spread and distributed with a broom drag.

A total of 24,913 sq. yds. of surfacing was laid at a total cost of $29,900, or about $1.20 per sq. yd. including excavation, engineering, testing and supervision. The city bore the cost of intersections, engineering and inspection, and assessed the property $1.10 per front foot. The cost of the curb and gutter was 95c per lineal or front foot.

Experience with this material shows that it must be held under close control to give satisfactory results, and should be placed only in dry weather. Work started in Sept. 1941 was interrupted by wet weather after only four blocks of the mat coat had been placed, and the rest of the base course had to be left uncovered until the following spring. Many days were wasted waiting for one coat to dry before the next coat could be laid, and the base left uncovered during the winter showed some deterioration in places. The present condition of the pavement appears to be excellent and it should give good service if maintained. It is thought that a maintenance seal coat will be needed every three or four years to prevent drying and raveling.

The work was done under the general direction of C. C. McCarthy, City Manager, who prepared the specifications. The writer acted as inspector on most phases of the job. The city was fortunate to obtain the services of K. L. Linder of the engineering staff of the city of Ames, Iowa (where considerable of this type of pavement has been laid) who did the field testing and part of the inspecting. The city is also indebted to the State Highway Commission for some of the more essential tests on the base material. Tests for the mix for the asphalt mat coat were made by the Patzig Laboratories of Des Moines, Iowa. Harold Clymer was superintendent of construction for the Hargrave Co.

Burning Refuse Replaces Fuel Oil

To meet the shortage of fuel oil, Lakeland, Florida, is using city garbage and trash as supplementary fuel at its light and power plant, making a saving of $30 a day on fuel costs alone.

The Deflector Surface Wash System

As developed and installed at Two Rivers filtration plant, Two Rivers, Wisconsin, using a spray nozzle adapted from sewage plant operation.

By ERWIN A. BARTZ

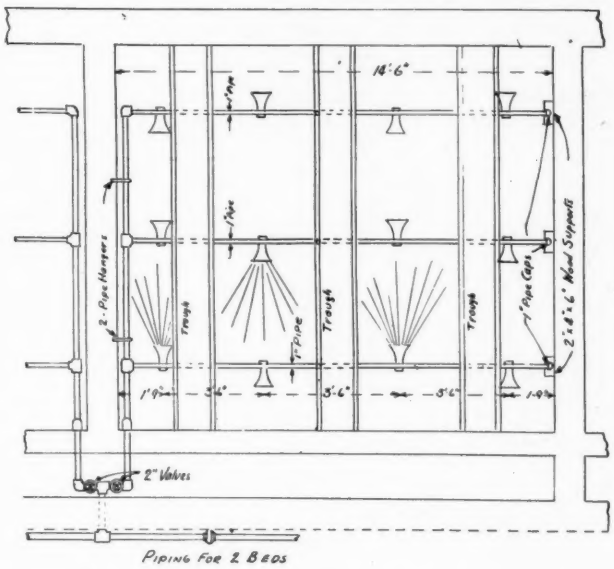
Filter and Sewage Plant Technician, Two Rivers, Wis.

Erwin A. Bartz

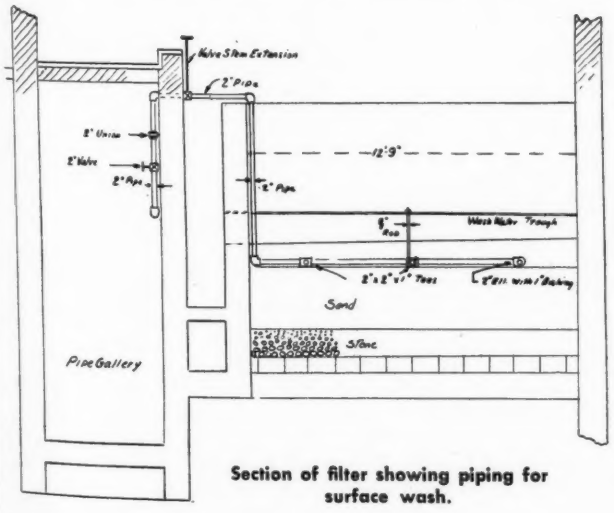
TWO RIVERS filtration plant, after its opening May 7, 1935, experienced troubles with mud ball formation on the surface of the filter sand, the same as other filter plants using Lake Michigan as the source of supply and primarily sulphate of alumina as the coagulant. Developments, studies and installations of surface wash systems designed to eliminate the mud ball trouble were watched and studied with keen interest. Our association with the West Shore Producers Association (Lake Michigan) gave us the opportunity to gather information and inspect installations of surface wash systems designed to eliminate mud ball formations. Some excellent work on this problem was carried out by the Kenosha filter plant, Chicago experimental plant, and Racine filter plant. Other devices and installations followed.

The writer's connection with sewage plant operation suggested the use of the deflector nozzle system as a surface wash for filter beds. This particular type of spray nozzle is used at some sewage plants for flushing the scum on tank surfaces onward to the lips of the scum troughs or boxes at the end of the tanks. An installation of this type is in use at Cleveland, Ohio Westerly Plant. This type of spray nozzle was installed at our filter plant as a surface wash system and is giving most remarkable results and satisfaction.

The surface mat of the filter bed is entirely broken up by the spread water jet. Mud balls and carbon deposits are completely disintegrated and carried off with the regular wash. We find that our filter beds are clean after each wash with no evidence of any mud balls whatsoever. Part of our odor control treatment is done by feeding activated carbon directly onto the filter beds, and this deposit also is completely dispersed by spray nozzle surface wash so that it rises and flows out with the regular wash.



Plan of filter bed, showing piping for surface wash.

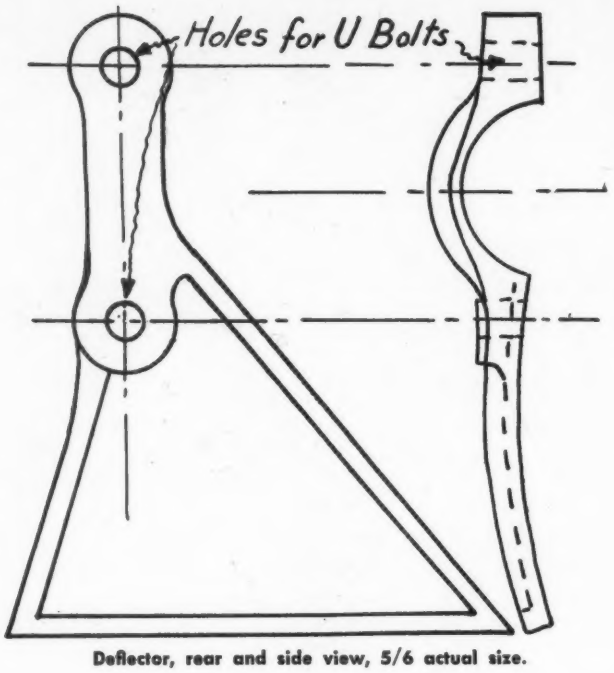


Section of filter showing piping for surface wash.

This installation saves the time and expense of cleaning the filter beds manually, which entails the entire sand and gravel removal, the washing, cleaning and sizing of the gravels, and the replacement.

The features of this surface wash are: There are no moving parts to cause wear, and the deflector jets or nozzles can be placed or spaced to any size or shape of filter bed so that the water spread will overlap and cover the entire surface area. The angle of deflection can also be varied by merely loosening the U bolts and moving the deflector up or down on the pipe to whatever angle desired.

The system consists of regular one-inch pipe with holes spaced according to the size of the filter bed and the number of deflectors needed. We have ⅛-inch holes drilled in the one-inch pipe. The deflector is fan shaped with curved surface (see drawing) which is placed over the ⅛-inch hole and fastened with a U bolt. Our water pressure on this surface wash is 62 lbs. As the water strikes this plate it spreads out and the jet draws the mud balls to the plate where the striking



Deflector, rear and side view, 5/6 actual size.

water breaks them up. The pipes are in a position above the sand so that the moving sand surface cannot wear the drilled holes, as in the conventional surface wash systems. We do find, however, some wear on the deflectors, but it can be overcome by hardening this casting. Our total wash water used is somewhat decreased with this system.

The installation consisted of bringing the water service from the pipe gallery to the surface of the filter beds, which required two wall openings. A two-inch line was connected to the two-inch service line already in the pipe gallery. Two tees and two valves were connected to the line and the pipe brought through the wall openings and a two-inch tee connected to same with short nipples and two valves, one for each bed, and then brought down to the bed surface and across the width of the filter bed with tees inserted for the three one-inch pipes across the length of the bed. The two-inch line was anchored to the wall with brackets and the one-inch pipes are held in place with eye bolts fastened to the lips of the cast-iron wash troughs and support pieces fastened to the wall. (See drawing)

The material and labor costs for this installation are quite economical, as shown by the following listing of materials and labor. Material required for one bed (Size 14′ 6″ x 12′ 9″) is:

24 ft. 2-inch pipe @ 21c	$ 5.04
One two-inch valve	4.00
52 ft. 1-inch pipe @ 10c	5.20
Three two-inch ells @ 40c	1.20
Five 2″ x 2″ x 1″ tees @ 68c	3.40
Three one-inch caps @ 13c	.39
Fifteen deflectors @ 15c	2.25
Four eye bolts @ 20c	.80
Three wall brackets @ 10c	.30
Fifteen U-bolts @ 3c	.45
Total	$23.03

The labor for the four beds was:

Two holes in wall, 1 man 4 days	$20.00
Filter operator labor, 11 hours	11.00
Total for four beds	$31.00

Our filter plant consists of four filters, bringing the total cost to $123.12. The holes in the concrete wall were done by outside labor, but all pipe installation was done by filter plant operators. These spray nozzles are a standard product of the Link Belt Mfg. Co.

Our washing procedure with this system is: After the bed is drained, the regular wash is turned on to such an amount as to bring the sand expansion to about 2½ to 3 inches from the deflectors; then the surface wash is opened for two minutes, then closed and the regular wash opened to maximum. We find this gives the bed a very good cleaning; the importance of which cannot be over emphasized, as only a clean filter will produce the best effluent.

We had the pleasure of showing and demonstrating this installation to the members of the West Shore Water Producers at a meeting held at Two Rivers July 29, 1942.

This work was done with the approval and cooperation of Paul Capraro, Superintendent of the Water and Light Department.

Determining Values in Fixing Water Rates

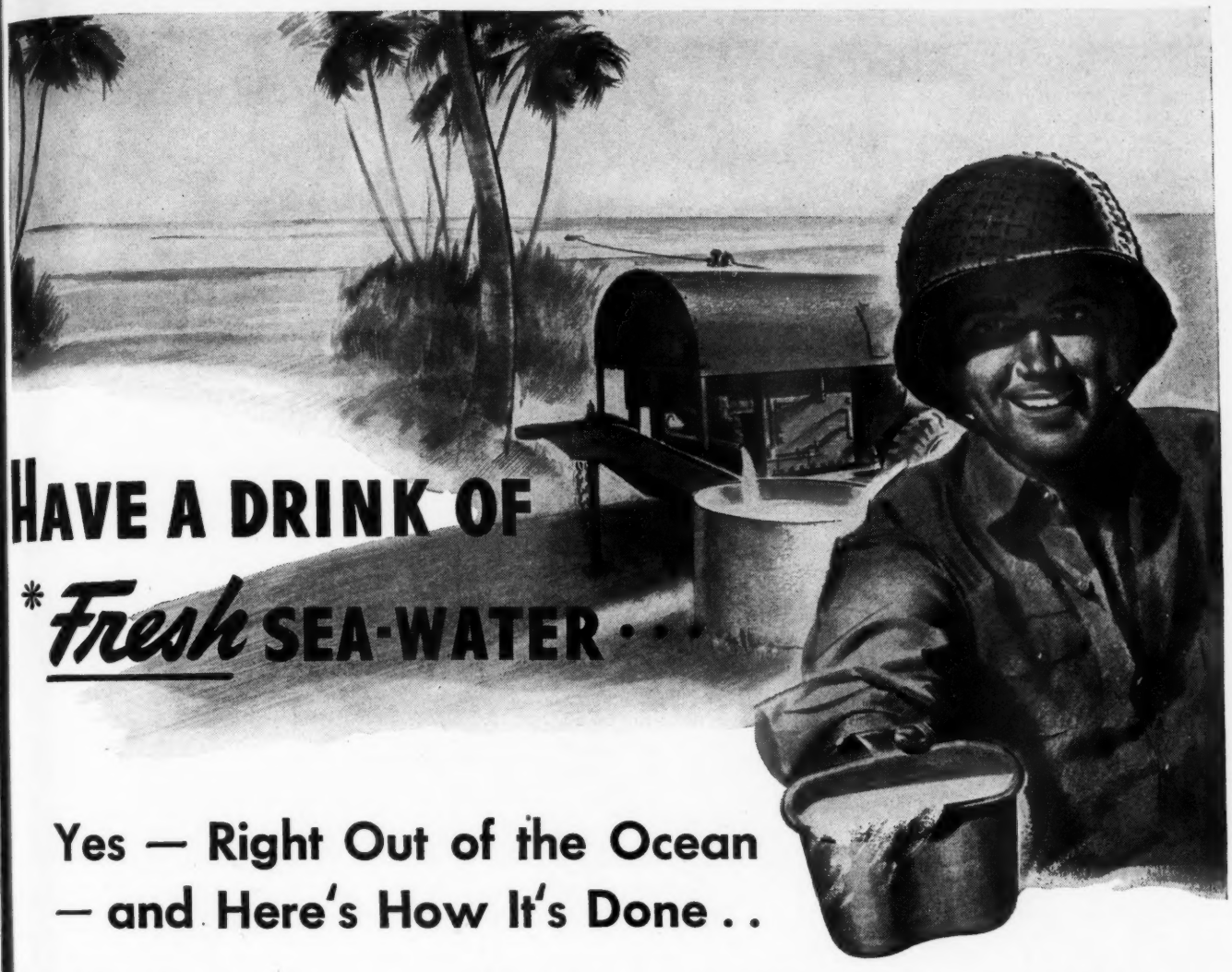
Actual and reproductive costs, with proper depreciation allowances, are important evidence of value, but they are not the sole criterion. The nature of the enterprise, the demand for its product, the development and stability of the business, the efficiency of management, the steadiness of income, the comparison with other forms of invested capital, and the State's regulatory control of the utility, are among the considerations of varying weight in determining value. In measureable degree, these factors, so far as found to produce strength and soundness of investment, may be found to create an increase of value over value tested only by investment costs with due adjustment for price changes in costs.

Depreciation reserve is required to maintain actual investment. In the estimate of a cost of a reproduced plant or of the cost of the existing plant on the basis of present-day prices, a depreciation allowance for present condition of the plant must be made to equalize the difference between old and new. The depreciation reserve does not belong to the customers; it is an asset of the utility. If, by its use in maintenance, it adds to actual value, the addition enures to the benefit of the owners of the utility. State v. Hampton Water Works Co., New Hampshire Supreme Court, 19 A. 2d 435.

Effect of War Production Activity on Population

The latest revised estimates of U. S. population trends made by the Census Bureau shows an increasing concentration of the civilians in areas of war production activity, where population has increased an average of 2.5% in the period 1940-42 as compared with a decrease of 3.1% in the other areas. The largest percentage gain of any area in the nation was made by Mobile County, Alabama—36.9%, or from 141,515 to 193,709. The next largest gain was San Diego County, Calif., with 34.4%. The third was the Norfolk-Portsmouth, Newport News area with 32.9%. Fourth, with 27.7% was Nuecos Co., Texas; fifth was the Washington, D. C. area, with 25%.

Detroit showed the largest numerical gain—324,772 (13.7%), and Washington the next with 229,504. The New York metropolitan area lost 404,074—a drop of 3.5%.



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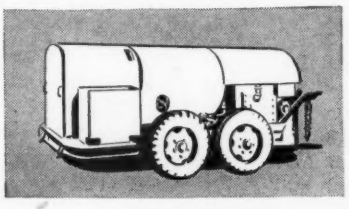
Cleaver-Brooks production right now is going 'round the clock for military needs, but we are glad to send complete information on tank car heaters, bituminous boosters, automatic steam plants — for your future needs.



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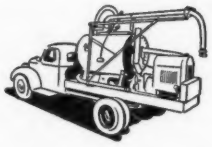
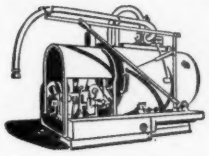
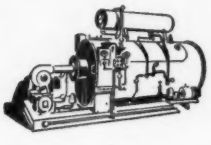
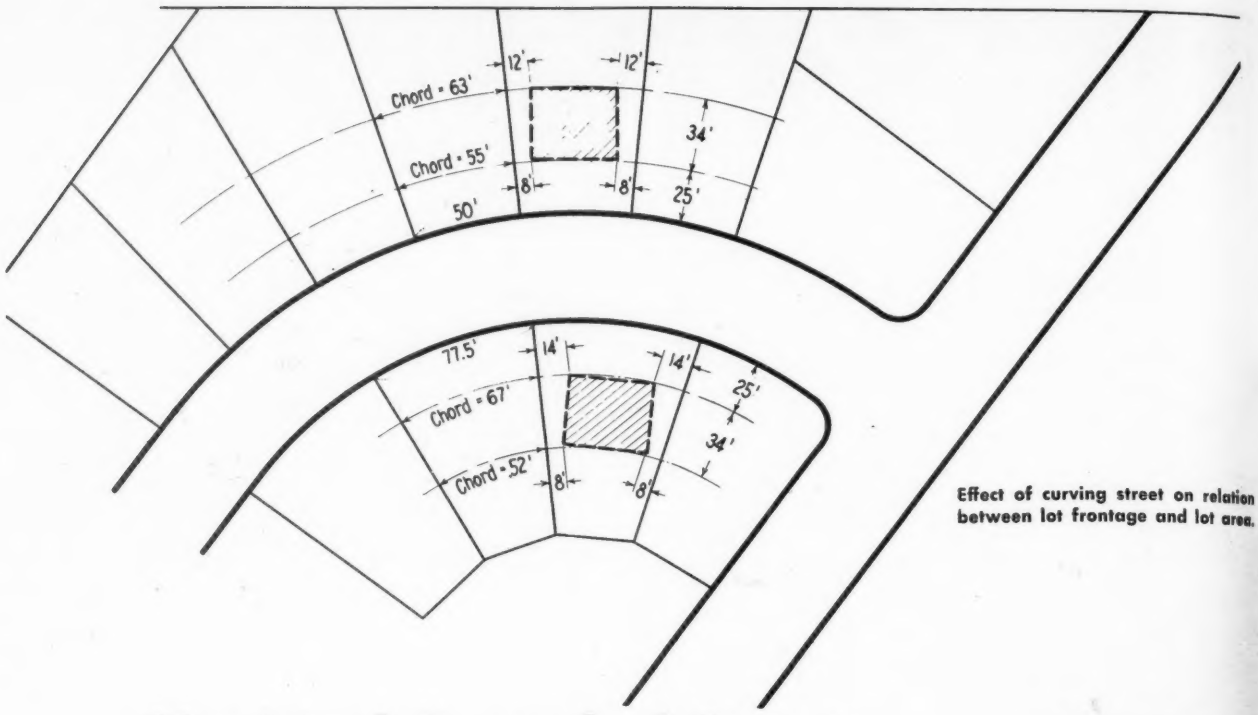






When you need special information—consult the classified READER'S SERVICE DEPT., *pages 55-57*



Effect of curving street on relation between lot frontage and lot area.

Municipal Control of Streets for New Developments

By **FRANK E. HARLEY**
Engineer for Fair Lawn, N. J., and Seven Other Communities

F. E. Harley

A municipality should protect itself by securing a properly designed layout, with wide streets, zoning of buildings, including lot areas and set-back, adequate drainage and sewerage.

THE character of new developments can improve or ruin a neighborhood. A municipality should protect itself against ruinous developments (except those imposed on it by the Federal Government for War Housing) by the use of judicious zoning, planning and building codes.

The development can be an advantage to the municipality, even if in a fairly low-cost price range, if the homes are well built and attractive and the layout properly designed.

The ultimate owner of the home must be protected. The average buyer of a home has this experience only once, and generally enters the market inexperienced. Unless the municipality throws its protection around him, he, as well as the town, will later suffer. Proper protection by the town protects not only the future home owner, but also the better-type developer, against the inexperienced and unscrupulous developer, who sells on the basis of price alone at the sacrifice of quality and essential elements.

Narrow space between sidewalks and curbs leaves little room for poles or trees. Note how pole is a pedestrian hazard.

The municipality must decide whether or not to insist that the builder provide all improvements and thus eliminate the necessity for assessing either the town or the property owner for them at a later date. The Federal Housing Administration has endeavored to require the builder to furnish everything, leaving no improvements to be paid for at a later date by assessment, although some towns' present requirements were so limited that it was impossible for this aim to be attained. It must be borne in mind that the new home owner is with us always, while the developer is usually in one year and out the next.

In the layout of developments, consideration must be given to the street design. It is generally desirable to have pleasing, wide streets with no direct crossing by side streets and with fairly long blocks, from six hundred to one thousand feet long, curving and winding to take advantage of contours and drainage require-

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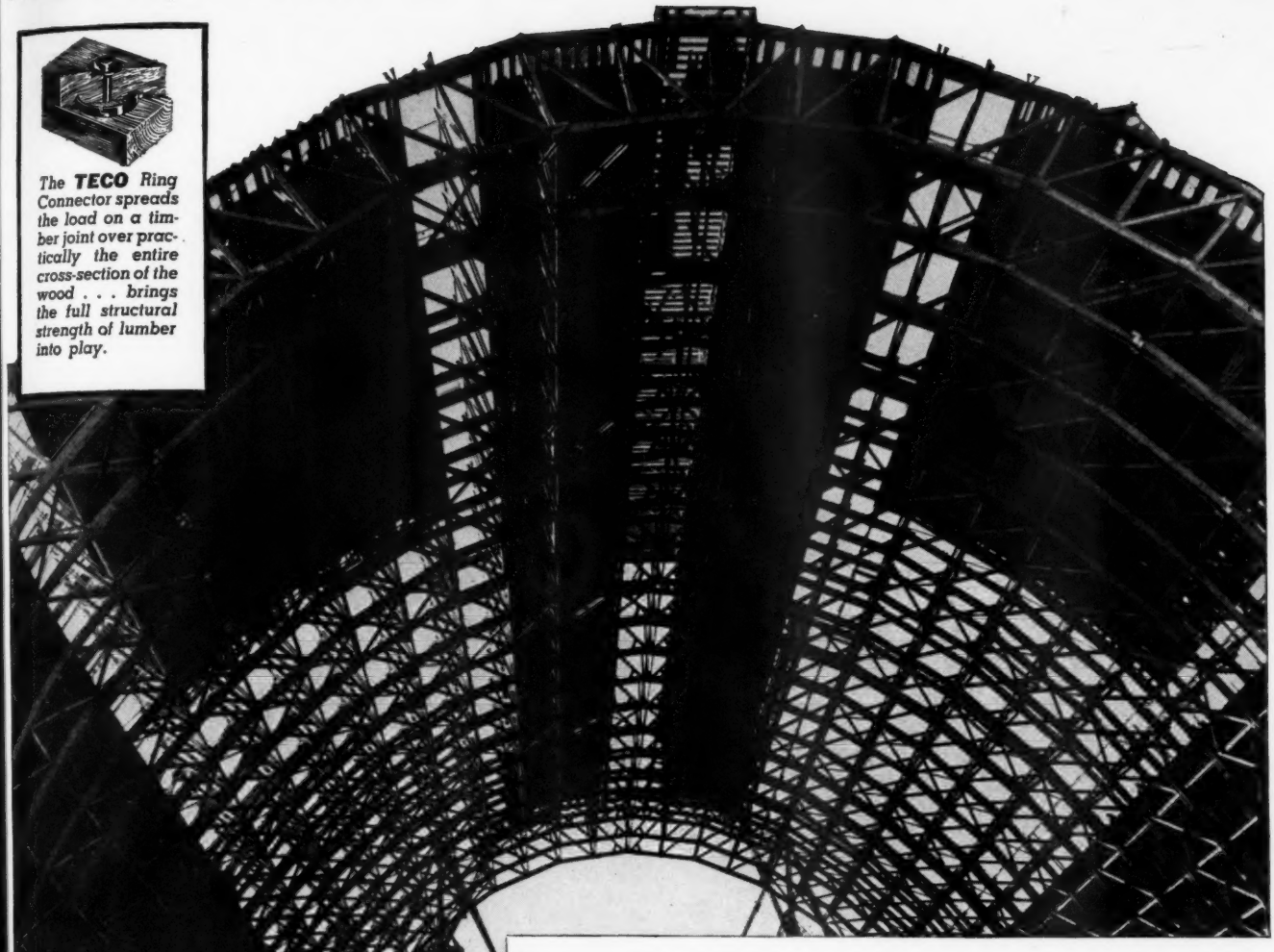

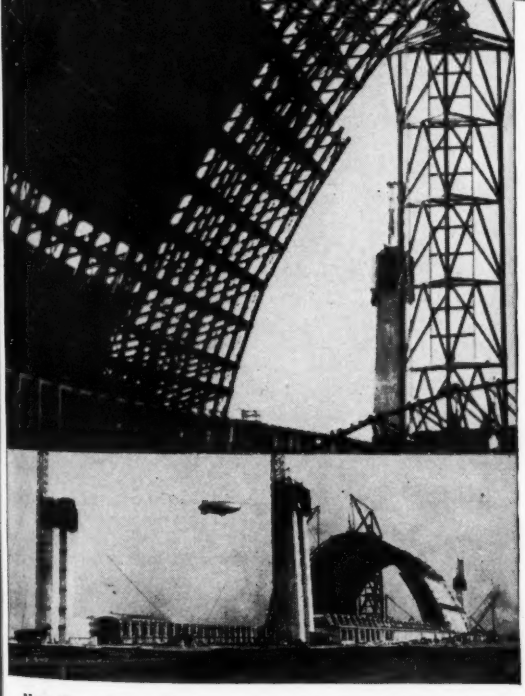

New Navy Blimp Hangar, 1000 feet long; 153 feet high; clear-span roof 237 feet. Timber treated for fire resistance according to Federal specifications. Trusses prefabricated by Timber Structures, Inc., Portland, Oregon.

OUR NAVY BUILDS WORLD'S GREATEST TIMBER STRUCTURE

mammoth blimp hangar was made possible by

TECO CONNECTOR ENGINEERING

Two announcements of the widest import to American engineering have just come out of Washington.

The U. S. Navy has announced that a giant blimp hangar, engineered entirely in timber, is nearing completion "somewhere in the continental United States."

The War Production Board has announced that "such a structure could not have been built of wood by ordinary methods without the use of timber connectors . . . The steel ring timber connector, which is used to increase the strength of joints in wood construction, saved more than 400,000 tons of steel for essential war production in 1942." WPB added that 2,050 tons of structural steel will be saved in this hangar alone.

In erecting this vast, multiple-truss assembly, Navy engineers have accomplished a notable achievement in modern timber connector engineering. The hangar is the latest of scores of large Navy, Army, and Maritime Commission projects built with Teco timber connectors under the revolutionary Teco system of timber engineering. It is one of over *100,000* heavy-duty structures, of over *600* types, built under the Teco connector system in the past few years. They include clear-span factories, bridges and trestles, towers, tanks, warehouses, docks, shipyards, and many others.

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Due to wide space between sidewalk and curb, plenty of space for tree growth, enough lawn to encourage proper care, and the flat slope possible on driveways.

ments and at the same time, if purely residential, to discourage through traffic and short-cutting by delivery men and others. In long blocks, it is quite essential to provide mid-block pathways, for easy access to schools, stores and busses. At the same time, these often provide drainage ways that are essential. Along main highways, particularly State Highway routes and through roads with heavy traffic, it is well to provide parkway strips of varying widths from twenty to several hundred feet, to reduce the annoyance of the traffic to the homes, and keep the children away from the main routes. These strips can be planted, and in many cases turned over to the State or County for maintenance along with highway maintenance. It is often desirable to have the houses back up to the highway, facing on a parallel street but having minimum access to the highway. In some cases, a marginal road separated from the main highway by a narrow strip of ten feet of parkway may be desirable. One disadvantage of this is the fact that it is the practice of the State on many through routes to dualize, or provide separate lanes for each direction, by use of a wide center island; and having a marginal road right alongside the main highway may cause accidents and confusion at night by the headlights on the side lane confusing the drivers on the main one-way lane. In every case, access to the main through route should be discouraged except at main intersections and controlled points of access.

Consideration should be given to providing sufficient small park areas to be used for play lots for the small children; and in larger developments, larger areas should be set aside for either immediate or future use as parks and recreational centers.

When a neighborhood develops into five hundred or one thousand homes, provision should be made for local shopping centers, including butcher, baker, grocer, druggist, delicatessen, restaurant and service station, with sufficient space for off-street parking. By proper landscaping and screening by well planned planting, these business centers can be made pleasing and not objectionable to the nearby homes.

In the physical construction of the streets, consideration should be given to the width of paved ways. As it is usual for cars to park in front of each home, a minimum width of paved roadways should not be less than 30 feet for side streets, and at least 32 to 36 feet on more heavily trafficked streets. The type of pavement will be largely governed by local conditions, but a permanent type of penetration macadam as a minimum should be constructed. The necessity of curbs, of either standard vertical type with slight batter or a modified curb with a roll-over effect, is obvious. The location of sidewalks is important, as the tendency has been to locate them too close to the curb, leaving no room for the growth of the trees or placing of poles, resulting in a few years' time in upheaved and mutilated sidewalks. Consideration should be given to placing the sidewalks at least 5 feet (10 is better) back of the curb, even though it is necessary to take a few feet away from the depth of the lot to get the wider right-of-way. The result will be a street of pleasing appearance, of apparent wide width, and, if the trees are planted along the property line instead of between the sidewalk and curbs, the street can be made a thing of beauty, instead of merely utility. So often the careless planting of trees results in shaded and screened street lighting, of little use except in winter, whereas by more careful planning, the full effect of the street lighting can be had the year round.

If the lots are graded and landscaped carelessly, the effect of properly planned streets can be lost, and this can also be the cause of many drainage problems, wet cellars and bad sanitary conditions.

Drainage and Sewerage

The drainage of a development is a matter of great importance. The ultimate disposal of this drainage often constitutes a greater problem to the town after the development is completed, than the original drainage problem of the development proper. Should this former cost be absorbed by the town at large, or should some provision be made for the developer to at least share a portion of the expense?

The matter of surface drainage in the development presents the problem of either providing very complete drainage, with basins at every intersection, or taking care of it on the surface of the street for longer distances. Where possible, along low areas or brook courses, easements should be provided for ultimate drainage utilization, so that, as the neighboring properties are developed, full use of the natural drainage courses may be taken advantage of. Good layout of the grades of the streets should avoid, if possible, any low spots, even though piped, that do not occur at a brook or drainage course, to prevent flooded conditions in excessive rainfalls.

A problem of rather serious proportions is presented when the roof drains are permitted to discharge into the street, which adds considerably to the load the drainage system is required to take and necessitates the installation of larger facilities to take care of it. In addition, if these drains are not led to dry wells, considerable difficulty is experienced in the grading of the yards, for by the time a dozen or more roofs have discharged onto the lawns, a goodly volume of water is destroying lawns and gardens, and is a constant source of trouble between neighbors. The extremely high run-off from roofs provides a high percentage of the total run-off in the storm drains.

In the absence of a sanitary sewer system, it may be

Sidewalk crowding curb makes a dangerous pedestrian condition at driveways; also the possibility of the side-swiping of pedestrians by cars close to the curb.

well for the developer to provide a plan of the future system, subject to municipal approval, and perhaps provide easements along the rear lot lines to avoid the wholesale tearing up of streets at a later date when these sanitary sewers are constructed. Proper care can be taken with the plumbing layout in the house, as well as the location of the cesspool or septic tank, to avoid any high cost for changeover by the property owner when connecting it to the town system later on.

The question of immediate sewage disposal, by either cesspool or septic tanks and tile fields, will depend on local conditions of soil. Consideration should be given to provide lots of sufficient size, in the absence of a sanitary sewer system, to take care of cesspools or tile drainage systems.

The matter of accepting maps and layouts, prior to the construction, and the deposits or bonds required to cover the costs of the street and public improvements should be given consideration. Before accepting the streets after completion, should consideration be given to find out if all the costs have been paid, all liens satisfied, or, what may the municipalities' responsibilities be in this matter? Further, it may be necessary to have a deed with all releases of mortgages covering the street being accepted. Finally, what form should the municipality use in taking over these streets, resolution, ordinance, or other means? Often after these streets have been accepted, they are littered with further operations of the developer. Should he be required to clean these streets when he is completely finished or is this a town problem and job?

The size of the plot for each house, setback from the street line, width of the street, should all be given consideration. In the case of curving streets, a minimum width of lot at the street line will result in a much narrower width at the building line, on lots on the inside of the curve, while lots on the outside of the curve will have a wider width at the building line. This should be given consideration to determine minimum lot widths. Consideration of area of plot required may be governed by the requirements of septic tank or cesspool construction.

"Pioneer Roads" in Central America

Emergency schedules have been adopted for putting into at least temporary condition for through traffic the uncompleted parts of the Inter-American Highway in Central America, to be completed by next June. The U. S. Congress appropriated $20,000,000 for the purpose, to be matched by $10,000,000 by the Central American countries, and our War Department has allocated $15,000,000 additional for a "pioneer" road to complete the unconstructed sections.

From the Rio Grande south to the Panama Canal three-fifths—nearly 2,000 miles—of the highway had been paved, or at least made suitable for all-weather travel, when we entered the war, and work is now nearing completion on "pioneer" roads to fill in the gaps. These roads will have a roadbed 10 to 16 ft. wide with an 8-inch gravel surface. Maximum grades of 10 ft. and maximum curvature of 100 ft. are allowed. This is extended to provide continuous overland transportation between the United States and the Panama Canal. Not the least important advantage will be the ability to bring strategic materials from these countries without the perils of ocean travel.

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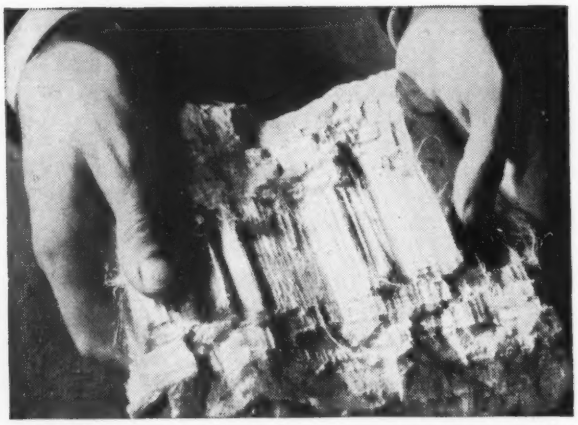

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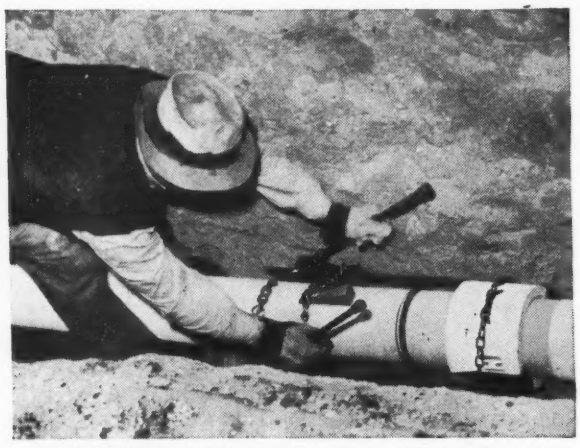

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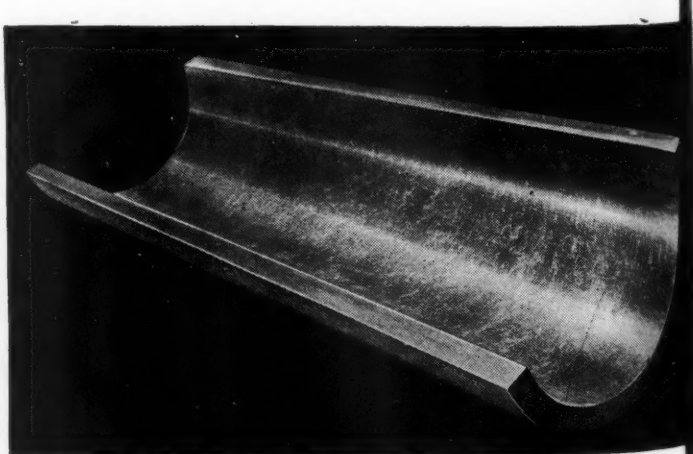

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Value of Graphs in Waterworks Records

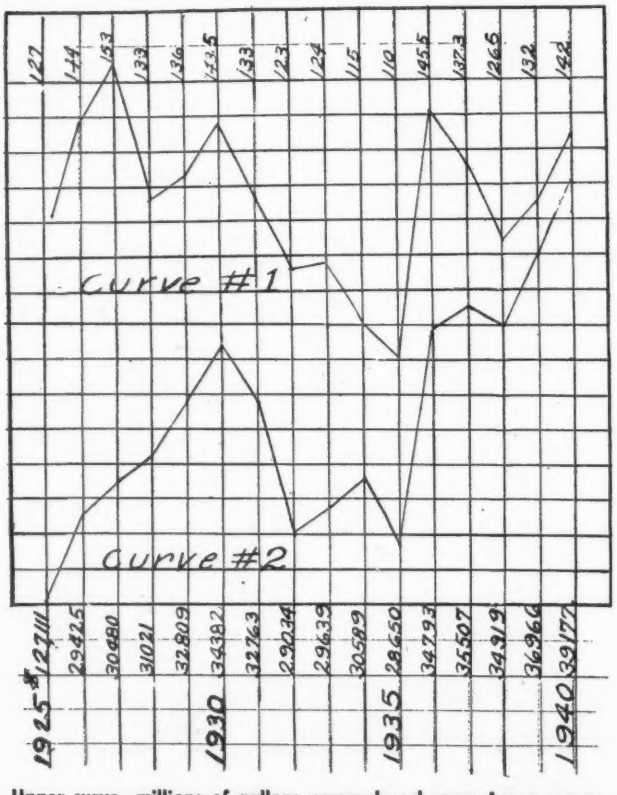
More readily understood by citizens than are figures. Also of practical value to the Water Department in keeping track of its finances.

By AMIEL REICHSTEIN

Government Engineer in Panama Canal Zone; formerly Supt. of Public Works, Fairfield, Ia.

AS Superintendent of Public Works in a small city in the state of Iowa, with a population of approximately 7,000 people, I was often asked questions concerning the financial status of the water department, both by members of the city council and by merchants who took an active part in civic affairs. As figures mean very little to most of us, we plotted up curves to show just what was done in the water department. We found the curves to be of considerable practical value and later extended their use to keeping a graphical record of the city's general bonded indebtedness.

By curve number one we showed the number of total gallons pumped from the water plant into the distribution system for the years from 1925 to 1940. Just below this graph was plotted the gross annual revenue that was collected for water sold to the customers, all of which was metered. In general, these two curves should run approximately parallel to each other and do, except from 1925 to 1928, during which time the pumpage curve is much steeper than the revenue curve. We learned that in 1927 the maintenance crew of the water department found a four-inch water main that was cracked all around its circumference and was discharging a large volume of water directly into a storm sewer underground. (This occurred before my connection with the city, which was not until 1928.) Had similar graphs been kept at that time, one glance at the two graphs would have shown that the amount of water being pumped was not in proportion to the revenue being received and that would likely have caused an investigation to find the reason why. That a large amount of water was wasted in the years of 1926 and 1927 is shown by the fact that the total water pumped dropped from 152,000,000 gallons in 1927 down to 133,000,000 in 1928, although there was considerable street improvement work done in 1928 and very little in 1927; but the revenue shows an increase from $30,480 for 1927 to $31,021 for 1928. From 1928 to 1940 the two graphs are approximately parallel, as they should be.



Upper curve—millions of gallons pumped each year, Lower curve—Revenue in dollars.

Another curve (not shown here) represented the total value of the water works, except the value of the land owned, beginning with 1931. The value in that year was arrived at by taking from the records, as near as could be determined, the year in which each unit or extension was added, estimating its total life, and depreciating it on amortization basis for its existing life to get the value in 1931. These values were then summed up to get their total value. The annual depreciation from 1931 on was determined by taking the value of each unit in 1931 and depreciating it on an amortization basis for the remainder of its life. These figures showed that the plant would be completely depreciated in 1965, except for improvements and extensions that had been and would be made. At the end of each year the value of the extensions and additions were summed up and from this was deducted the annual depreciation and the difference was added as an annual appreciation and plotted with the depreciation curve.

We made use of curves to show other things, such as the amount of money required for operation, anticipated improvements, accrued sinking fund, etc.; but it is believed that those described furnish evidence of what can be done to show a graphical picture of the finances of any public utility, which is the purpose of this article.

Location of Catch Basins

The law does not make a city an insurer of its streets and other passways, but holds it responsible only for such conditions as may reasonably appear to be unsafe to the users when exercising ordinary care for their safety. The fact that a catch basin was located within the lines indicating a cross-walk did not make the city liable to a pedestrian whose shoe heel caught between the bars of the drain and the pedestrian was thrown into the street. McNeal v. City of Louisville, Kentucky Court of Appeals, 151 S. W. 2d 749.

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American Road Builders to Prepare for Peace

On May 4th to 7th members of the highway industry and profession will meet in Chicago to discuss problems of war time and a post-war program. On the 4th will be held meetings of the County Highway Officials, City Officials, and the Planning and Educational Divisions; and on May 5th, 6th and 7th the annual meeting of the American Road Builders Association.

While the government discourages travel to conventions of most organizations, those of public works men —highway, water works and sewerage officials—are encouraged for the discussion of problems directly connected with wartime work. For the past year conventions of such societies have been devoted largely to such subjects, and this will be true of the coming convention of the ARBA, in which officials of the Federal government will participate in discussing present problems of highway, airport and military construction, and a post-war program.

Sixteen months ago we were suddenly shot into the war, and since then have been gradually withdrawing men from non-war occupations, with resulting inconveniences to almost every one, except the unemployed. Perhaps sixteen months from now, perhaps sooner or later, the war will end as quickly as it started. Then the ten million gradually drafted into the armed forces will be returned to civil life within the few following weeks, but the need for the twenty million or more engaged in war industries will disappear over night.

How can twenty million men be given jobs in a week, thirty million within a few weeks? Large manufacturing plants cannot change over to the manufacture of peace-time products in such a short period—for many it will require months. For filling in this interval, most agree that dependence must be placed upon public works. And of these, Department of Labor studies indicate that streets and roads not only furnish the most on-site and off-site employment per dollar spent, but could be started more quickly than any other class of work. Also most of this work *can* be done by hand labor and few tools until sufficient equipment can be obtained to do it more economically—no "boondogling" need be tolerated.

That sufficient road work can be found for the purpose is not doubted by ARBA officials. Thousands of miles of roads are being subjected to a war traffic heavier than they were built for, and will need extensive repairs if not reconstruction after the war. Other thousands can then be given the higher class of surfacing which only lack of funds has delayed. Then there will be hundreds of airports to be built (and runways are practically wide roadways) to meet the demands of the enormous increase in air traffic that is sure to follow the war.

Every state, county, city and regional area should have a planned program of highway construction. Reserve funds should be accumulated now to finance post-war projects or to participate with the federal government on a matching or loan-and-grant basis.

A program is under discussion by the ARBA that contemplates spending three billion dollars a year for five years on highways. Another two billion would, it is assumed, be spent on other public works.

But plans, specifications and cost estimates must be ready the day after the war ends; and it *may* end in sixteen weeks.

To force this urgency home to all responsible for highway plans and highway policies is a prime aim of next month's convention.

A Post-War Program for Waterworks Officials

A committee of seven members of the New England Water Works Association was appointed last year by the Executive Committee of that Association, with E. Sherman Chase as chairman, to report recommendations for post-war activities for waterworks officials. In a preliminary report submitted March 18th, this committee said, in part:

Local communities and private business should look ahead and plan in so far as possible to prevent or reduce unemployment at the close of the war. Water works men can and should play a part in the program looking towards alleviation of the post-war problems.

The following suggestions as to what can be done in the water works field are presented as a preliminary and tentative program.

1. Employees returned from the armed services should be restored to payrolls in so far as practicable.
2. Investigations of the condition of water works systems with respect to need for repairs and overhauling should be inaugurated.
3. Maintenance work, such as painting hydrants and standpipes and repair of valves, which probably has been interrupted during the war, should be resumed.
4. Reinforcement of distribution systems should be provided.
5. The carrying capacity of mains should be restored by cleaning alone or by cleaning and relining.
6. Undersized mains should be replaced by mains of adequate capacity.
7. Increased storage should be provided on distribution systems with particular reference to the lessons taught by wartime experiences abroad.
8. Needed extensions of mains should be made.
9. Obsolete pumping equipment should be scrapped and new equipment provided.
10. Obsolete office systems should be replaced by modern methods.
11. Records, if incomplete, should be brought up to date.
12. Complete and accurate maps of water works systems should also be brought up to date.
13. Construction and shop equipment should be overhauled and repaired. Worn out or obsolete equipment should be replaced.
14. Stocks of materials depleted as a result of the war should be brought back to normal.
15. Waste water surveys should be put into effect.
16. Metering programs should be adopted where necessary.
17. Reforestation of watersheds should be extended.
18. Sanitation work on watersheds should also be expanded.
19. Additional sources of supply should be developed in those cases where existing supplies are inadequate.
20. Major improvements such as new shops, new pumping stations, duplicate supply mains, filter plants and similar work should be constructed where their need has been established.

Conclusion. What any one community should undertake must be determined by local needs and financial ability. Each water works superintendent or manager should prepare and plan now for what he should do as soon as the war is over. To this end, he should start first to educate his commissioners or boards or directors, and then the public. He should secure the co-

operation of other agencies such as state health departments, chambers of commerce, newspapers, fire underwriters associations, veteran organizations and labor unions. It is highly important that the public be thoroughly educated as to the importance of first-class water works systems.

It is essential that as much as possible of the preliminary ground work and planning be done prior to the war's conclusion in order that a minimum delay may occur in putting men back to work. The basic foundation of economic security is work for all who are able to work. Production of useful goods and services, and not unemployment insurance payments, is the key to increased individual and national wealth.

Regionalization of Sewage Purification

Suggestions by the (British) Institute of Sewage Purification for adoption in post-war reconstruction.

The Institute of Sewage Purification (England) has had under consideration the possible reorganization of sewage purification services in connection with post-war reconstruction, and has prepared a memorandum for submission to the Ministers of Works and Planning, of Health, of Agriculture and of Fisheries, and others concerned with sewage purification and rivers conservancy, of which we present the following abstract, since the suggestions are to a large extent equally applicable in the United States.

In Great Britain, as here, responsibility for disposing of its sewage in a legal way is placed upon individual municipalities, however small. The effects of insufficient purification of its sewage are seldom felt by the community in which it originates, and many communities are so small that they can not reasonably be expected to employ competent operators of their plants. Also it would in many cases be possible to produce better results and decrease the cost to each, if several communities combined to build and operate a single plant.

For these and other reasons the Institute believes that "The service of sewage disposal is capable of being efficiently and economically dealt with by planning on a regional basis, and is thus not primarily affected by the maximum or minimum size of area or population." By regionalization they mean "the direction of a number of sewage works within an area by a single administrative control, and not necessarily to involve centralization, which implies the creation of one or more large works to take the place of many existing works within a prescribed area."

Whether treatment of all the sewage in any one area be done by the "centralization of all purification at one works, or by dispersal to a number of works, is an economic question dependent upon the physical features of the area concerned. In some cases it will be cheaper and more efficient to build longer sewers and centralize the treatment plant, and in others (probably the great majority) to have shorter and smaller sewers and a larger number of purification works."

"In the future development of sewage purification works the township should cease to be the unit of area for the administrative control of such works; the unit should preferably be the natural drainage or catchment area of a river, or of a tributary in the case of major rivers, which should for the purpose of this service be under the control of a regional authority possessing full executive powers." Probably the

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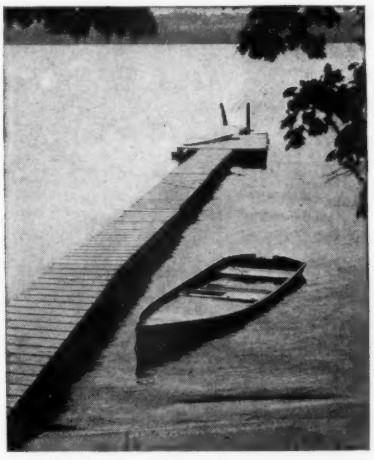

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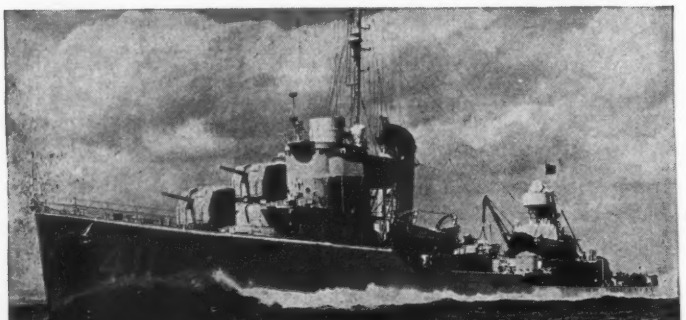

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regional sewage authorities should have some control over all waste water flowing from an urban area, whether by way of sewers, storm water overflows or surface water drains.

Regional authorities should be charged with the design, construction and operation of all publicly owned sewage works in their respective areas, and responsible to the appropriate rivers conservancy authority for the satisfactory purification of all polluting liquids arising therefrom. Such regional authorities should be possessed of full powers for the shaping of local policy, and the execution of works, subject only to general direction by a central authority.

The regional authority should also be responsible for the design and construction of intercepting sewers rendered necessary by regionalization, and the power to connect to them. With it should rest the decision (subject to the legal rights of the local authority and the trader) as to the conditions on which trade effluents should be discharged into the public sewers, but local drainage should remain essentially a service of the local authority.

The regional authorities should relieve local authorities of all responsibility for sewage purification.

The territory to be covered by individual regional authorities should be determined by natural boundaries, such as a catchment area.

The central authority should be charged only with the outlining of broad policy on a national basis of the work of all regional authorities.

Sewage purification should form a part of a larger plan for the conservation of rivers and streams, and it should be considered along with land drainage, and with the use of water for domestic and industrial purposes, agriculture, fishing, recreation and navigation.

Co-ordination with bodies having other responsibilities in the same catchment area, such as navigation authorities, land drainage boards, water undertakings, and river pollution prevention authorities, could be effected by inter-representation on the various bodies.

The following are some of the results which might be expected to accrue from regionalization:—

(*a*) The regional authority would be able to draw up a long-term programme of work; and to employ a competent staff of trained personnel, capable of administering the service on a wide and comprehensive basis.

(*b*) There would be closer co-operation between those responsible for design and those responsible for operation.

(*c*) Small plants would be supervised as adequately and effectually as large ones, and the wider experience of the staff would enable these smaller works to be made to function to the best advantage.

(*d*) The position which now often obtains whereby the good work of one authority in the purification of its sewage is nullified by the failure of its neighbor to carry out its obligations would be avoided.

(*e*) Variations in the cost of sewage treatment would tend to be evened out.

(*f*) Similar regulations for the admission of industrial wastes to sewers would prevail over a wide area, and any advantage associated with large sewerage schemes, such as the balancing effect on flows, and the equalization of industrial wastes, could be utilized.

(*g*) A comprehensive policy in regard to research could be laid down and carried out by the regional authorities, in collaboration with the central authority.

(*h*) The work of the rivers conservancy authority would be facilitated in that it would deal with fewer sewage purification authorities.

(*i*) There would be close co-operation with other water users, and the costly promotion of, and opposition to, Parliamentary Bills would be very largely eliminated.

(*j*) Regionalization would materially assist in the utilization of sludge for agriculture by making practicable the setting up of a centralized marketing and distributing organization.

We consider that the advantages set out above are sufficient justification for our recommendation that the post-war planning of the service of sewage purification should proceed in the direction of the setting up of regional authorities having jurisdiction over one or more catchment areas, and responsible for all matters relating to the service of sewage and storm water purification within such areas.

Road Maintenance Becoming a Serious Problem

The disastrous effects on highways of one of the most serious winters on record is precipitating a maintenance problem of critical proportions in many sections of the nation. This situation is made even more serious because of manpower and material shortages, and in some instances lack of funds.

Declines in highway maintenance personnel have reached 33 per cent on a national average with Maine reporting a loss of 61 per cent of its maintenance manpower according to a recent national survey.

In some of the more congested war production areas street surfaces have become so badly worn that traffic is re-routed over other streets, which it is feared, will soon show equal deterioration. It is reported that there is some hope of securing preference ratings for maintenance materials but to date labor requirements have no status with the United States Employment Service.

The rural road maintenance problem in some sections has been greatly aggravated by the opening of new mines and other projects in areas having no railroad facilities and no high-type surfaced highways. The resultant increase of traffic over secondary roads is reported to be causing rapid deterioration and it is feared that the maintenance problem this Spring may approach almost unmanageable proportions.

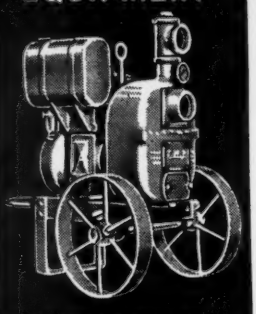
Congress gave some recognition of this situation by writing into a deficiency appropriation bill an additional $40,000,000 for the Public Roads Administration, which, it is said, may be used for maintenance purposes.

The serious effect of deferred maintenance on wartime traffic and highway investment is being brought to the attention of Federal officials with urgent requests for action in supplying labor, materials and funds.

Rolled Concrete in Australia

Crushed stone is comparatively plentiful near Melbourne, Australia, but sand must be brought 30 miles. and cement 50 miles, so that concrete containing a low proportion of cement is favored, and a type of road surface called "rolled concrete" has been tried out on about 8 miles of road, using a mixture of 1 cement, 2½ sand and 10 to 12 of coarse aggregate. This is mixed, spread (preferably by hand, since the coarse stone tends to segregate) and rolled, then tamped with stiff steel longitudinal tamper 22 ft. long. A mixture with only 8 parts of stone tended to flow ahead of the roller and a smooth surface could not be obtained, even with a light 3-ton roller. To avoid honeycombing along the edges, vibrators proved unsuccessful and a richer mixture is placed along the forms.

C. H.& E. CONSTRUCTION EQUIPMENT



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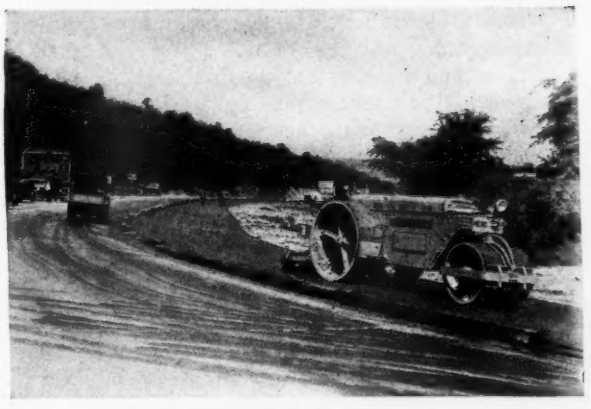

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Lewiston, Idaho, Water Dept. Saves Money by Modernizing Equipment

(Continued from page 19)

The discharge piping in the grounds adjacent to the building had to be entirely replaced by new pipes. By careful planning and timing, it was possible to keep the plant in operation with the exception of a few days, during which time an ample supply of water was in storage.

The pump room is not over the clearwell, as in many plants, but is in a separate building with the pumps below the ground level. In tearing up the floor of this room to relocate and extend the hairpin-shaped suction line, many surprises were encountered. Three concrete floors were discovered and a varied assortment of large, heavy concrete bases, some over three feet in thickness used in previous installations, with any number of large size anchor bolts. There were also two old suction lines whose purpose is lost in the shades of the past.

The Clearwater river is subject to flash flood stages during the winter season and the flood stage of the river is higher than the pump room; consequently every possible precaution had to be taken to protect the pump room from flooding while part of the floor and one end was torn out. The river, whose daily seasonal variation in flow ranges from 1200 to 170,000 second-feet, rose once during the reconstruction work but not sufficiently to cause any trouble.

Reasons for Change

There are several good reasons and economical justifications for the installation of new equipment. The first and most important was safety; the need for reserve or stand-by pumps. The demand during the summer months taxed the old pumping equipment to capacity and for a short period during the hottest weather, it didn't quite meet the peak demand on the high-service system, and it was necessary to depend on the stored supply to some extent. This condition was very undesirable and was the result of the growth of the city the past few years.

The second reason was the inefficiency of the old pumps and the higher cost of operation as compared to more modern equipment. The water department was being penalized for every day the old pumps were in operation. Repair parts for these pumps are very difficult or impossible to get, thereby creating a hazardous condition.

The flexibility of the new set-up makes it possible to adjust the load according to the consumption of water. This keeps the power demand in better proportion and the rate much cheaper, as will be seen by the figures given elsewhere. It also improves the operating conditions by making it possible to employ another operator and have a more desirable arrangement of shifts. The new control panel also removes a hazard by eliminating the old one, which was no longer in the best of condition and was also below the present standard in type of equipment.

As a result of new fire-fighting equipment and the pump installation, the Idaho Surveying and Rating Bureau has assured the City of Lewiston it will have a fire insurance rating of Class IV, the lowest in the State. Previous to these improvements our rating in 1940 was Class VI. This means a savings of thousands of dollars to the people of Lewiston.

Since the pumps have been placed in operation, Mr. Hughes has been able to assemble data to show their earning capacity. Figures for the ten months' operation show a saving in power costs of $5.786 p.m.g. when compared to the same ten months of the previous year. During this period 437.066 million gallons were pumped, which makes an earning of $2,525.49.

Ten Months	*Gals. of Water*	*Power Cost*	*Power Cost P.m.g.*
1941	405,650,000	$9,845.80	$24.272
1942	437,066,000	8,079.60	18.486

Power cost saving p.m.g. $5.786

The power saving is made possible by the higher efficiency of the new pumps and motors and by wider choice of units, making it possible to select pumps which more nearly meet the water consumption. This gives better utilization of power by keeping down the demand rating. Running a large pump for a short time is much more expensive than operating a smaller one over a longer period with low demand.

The saving during the hot, dry season of heavy consumption is, of course, due to the higher efficiency of the new pumps. It would be desirable for managers and superintendents to consider the earning capacity of each pumping and generating unit. Such a study, made regularly, would often reveal that some of the poor earners—or rather losers—would serve their country better on scrap piles. Pumps, like poor breeds of cattle, can soon eat their heads off and show a loss.

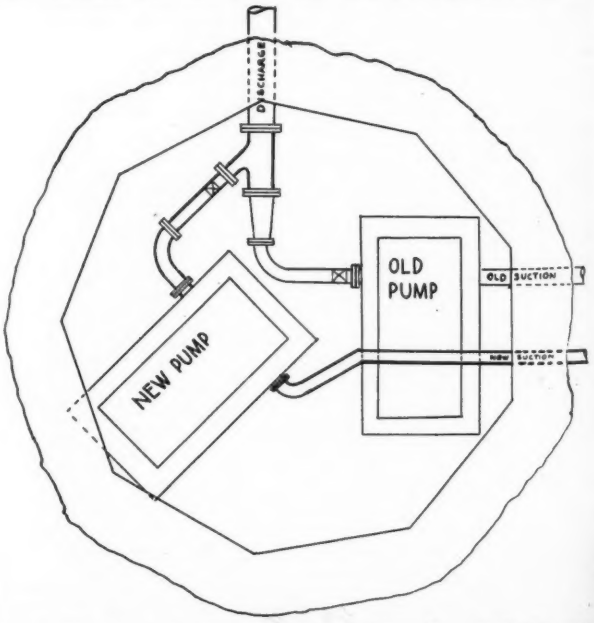
Burns & McDonnell Engineering Co., of Kansas City, Mo., not only designed the original purification plant but also were responsible for the details on the new installation. Direct supervision of the work was under city engineer W. P. Hughes. Assistant city engineer R. B. Anderson was in charge. Winston H. Berkeley is plant superintendent.

Putting Two Pumps in a Space Designed for One

By J. A. WALLIS

Superintendent, Malvern, Ark., Water Works

MALVERN, ARK., found it necessary in 1935 to install a new pump in place of its two old pumps, a Fairbanks-Morse 1000 gpm pump being selected. The building that housed the old pumps was not suitable for the new one and it was decided to



Pump pit with both pumps installed. Heavy lines indicate new pipes.

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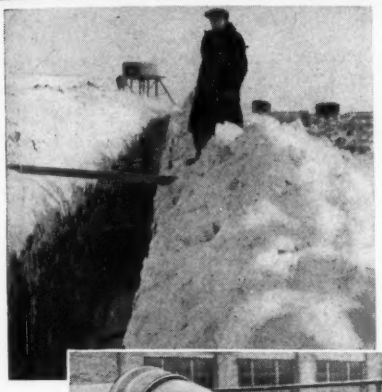

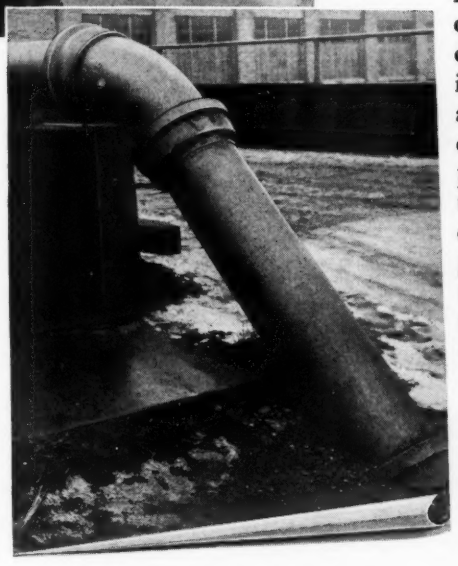

Today TIME is more precious than ever before. In water line construction it can be conserved by faster laying and speedier clearing up. Because Tegul-MINERALEAD's sulphur base includes THIOKOL (synthetic rubber), joints made with this compound show much less initial leakage and perfectly tight joints are obtained in a much shorter period of time.

To these important facts, add that *Tegul*-MINERALEAD, in the form of 10 lb. ingots, is more easily handled, needs no skilled labor, caulking or deep bell holes; is impervious alike to water and to composition changes (which occur in some compounds due to "shaking down" in transit from factory to job); weighs only one-fifth as much as lead—and goes three times as far; melts without sediment and pours and sets quickly, materially reducing labor costs.

More FIGHT in Every Joint

Add further that joints made with *Tegul*-MINERALEAD have much higher resistance to mechanical shock and vibration, and stand up under conditions that destroy lead —and that this is the only practical compound for lines carrying hot water, or subject to alternately high and low temperatures.

The sum total of these *Tegul*-MINERALEAD advantages is a definite

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that you can hardly afford to overlook when you plan the laying of bell and spigot lines.

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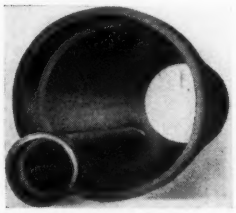

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VICTORY EFFORT CALLS FOR CONSERVATION OF LEAD, A STRATEGIC WAR META

construct a new concrete house to receive it, retaining the old pumps in the old building as stand-by equipment.

It was believed that this pump would furnish sufficient capacity for many years to come, and the new pump house, construction of which included excavating 10 ft. into solid novaculite rock, was designed and built to accommodate the one pump only. It was built as a nonagon, lined with concrete walls about 24 in. thick, and cost about $6,000.

In 1941, due to the unexpected growth of the city and the increased demand for water, it became necessary to increase the pumping capacity and a second Fairbanks-Morse 1000 gpm pump was purchased. As building a new house for this pump would be very expensive I got busy figuring some way to find room for it in the existing one, finally succeeding as follows:

By cutting out a few inches of concrete at points in two sides of the wall I made room for placing the new pump at an angle of 45° with the old one. Then the 10″ discharge line inside the building (reduced to 5″ at the pump) was cut off near the wall and a 10″x10″x5″ Y branch attached, and connected with the discharge ends of the two pumps by use of 90° bends. The suction of the new pump had to be brought in through the wall on the far side of the old pump, and to get it past the old pump I put a 45° ell on the new pump suction flange, following this with a special 8″ offset of 5″ steel pipe (made up by a local welding shop) which raised the suction and changed its alignment so that it could pass above the base of the old pump but below the shaft and coupling between its pump and motor.

The plan worked out very satisfactorily considering the difficulties involved.

Institutional Sewage Treatment and Water Supply

(Continued from page 15)

by motor-driven chain and flight scrapers and skimmers.

A small dosing tank conveys the effluent by gravity to a conventional circular trickling filter equipped with reaction type rotary distributor. A float switch in the dosing tank controls a recirculation pump delivering liquid from the final clarifier. Subdrains beneath the filter are parallel and pass from one open inspection chamber to an open effluent channel. Provision for submerging the filter stone for fly control or removal of excess incrustation of the media is provided by means which still passes all incoming liquid entirely through the filter beds before reaching the outlet weir. This permits the flooding of the filter without interrupting the otherwise normal operation of the plant and without materially decreasing continuous filter efficiency.

From this point, the filtered liquid passes to the center stilling drum of a cone-shaped final clarifier. This unit is not serviced by cleaning mechanism (the slope of the cone being 1.4 to 1, but the sludge suction at the bottom of the cone is connected with a recirculation pump located in the basement of the adjacent control building to provide for automatic return of sufficient liquid to the inlet of the primary clarifiers to maintain a desirable minimum rate of flow during low flow periods.

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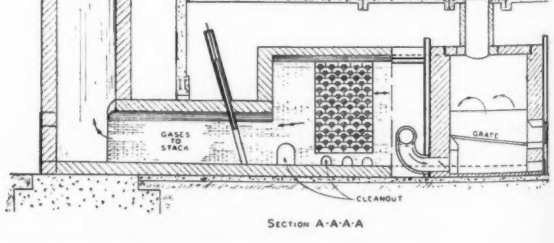

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Control Building. The control building is built adjacent to a circular insulated sludge digestion tank. The basement houses one sludge and one recirculation pump and all valve controls. Between the operating room and the digester, a small room gives access to the supernatant draw-off valves. Beneath this room is a sludge concentrating tank used to permit the solids in "today's supernatant" to settle for one day, prior to pumping the liquid to the primary clarifier and the settled solids back to the digester.

The digester is equipped with a floating cover and hot water heating coils which are serviced by a sludge gas-fueled hot water heater and an auxiliary coal-fired unit used as necessary. An open sludge storage tank having the same diameter as the digester, but with one half of its capacity, is located nearby to provide for winter storage of digested sludge before pumping to sand sludge-drying beds during favorable drying weather. The open storage well likewise provides emergency capacity in the event of foaming difficulties. A displacement type sludge pump is so valved that it may transfer or circulate sludge from or to the clarifiers, digester, storage or beds. The final effluent is chlorinated, at least during all but winter months.

General. The appropriation for sewage treatment plant installation was $60,000. It was completed at $46,000. One operator is responsible for the operation of both plants.

Wheel Load Distribution for Shear in Timber Bridge Stringers

(Continued from page 17)

the latter in a straight line from $m = 0.60$ and $v = \frac{1.65}{1.5x + 1.00} - 0.50$ to $m = 1.00$ and $v = 1.00$. They are plotted in dotted lines in Fig. 3 and in full lines (curves) in Fig. 4. The latter are believed to be somewhat more convenient to use.

Values of m less than 0.20 and greater than 1.00 are not likely to be encountered for timber bridge stringers but for the former the formula would be

$$V = m\left[\frac{5.25}{1.5x + 1.00} - 2.5\right]$$

and for the latter $v = m$.

"Limited-Access Roads" Being Planned

A "limited-access road" is described as one designed to serve through traffic rather than abutting property, traffic being permitted to enter and leave it only at certain selected points. Says Commissioner Thomas H. MacDonald of -the Public Roads Administration: "Many States cannot now build these advanced motorways. Statutes limiting road widths inherited from the horse-and-buggy days, for example, often prevent acquisition of adequate rights-of-way for the broad, uninterrupted arteries required by modern, high-speed vehicles.

"Limited-access facilities are also unattainable without special legislation because of the common-law right of access of abutting property owners to a public highway. Even when a heavily traveled road is located through an undeveloped area, it is soon lined with a variety of establishments, each one exercising its right of direct entry. Driving down this busy avenue then is like running the Indian gantlet of pioneer days. Only by law can access be limited and a highway made safe and suitable for modern traffic.

As more materials are diverted to essential war uses, new equipment becomes more difficult to get. Greater care must be given present equipment until after Victory. Let your Gorman-Rupp distributor restore your equipment to its original operating efficiency. They carry parts and repairs for all equipment they sell. Their charges will be reasonable.

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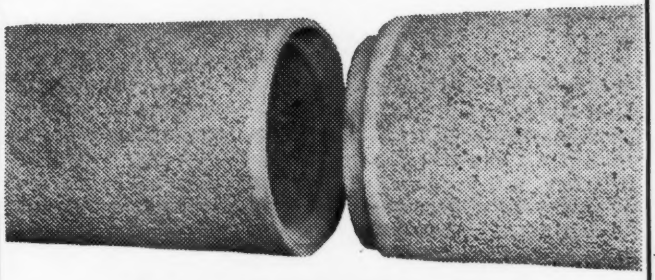

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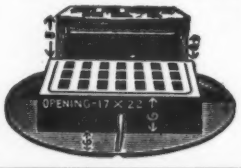

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"We hope many more States will enact limited-access highway legislation so that advance planning of these modern facilities can begin. Some of the existing laws should also be revised to incorporate all the best features of this type of legislation."

Twelve states already have laws necessary for building such roads and seven others are now considering legislation that will enable them to build them when peace comes. A draft of a model limited-access highway law has just been prepared by P. R. A. which is a composite of the best portions of existing state laws.

The model act defines two types of limited-access roads: Parkways, from which trucks, busses, and other commercial vehicles are excluded; and freeways, which are open to all traffic.

It stipulates that cities and other subdivisions of government as well as the State shall have authority to establish such facilities.

It authorizes the division of these facilities into separate roadways for each direction of travel, and prohibits access from abutting lands except at designated points.

It provides for acquisition of sufficient right-of-way for the facility itself and associated service roads, including "rights of access, air, view, and light."

It gives highway authorities power to designate existing streets or highways as limited-access facilities; with the consent of the government unit concerned, to eliminate existing intersections by means of grade-separation structures or closure; and to provide necessary local service roads separate from the limited-access facility.

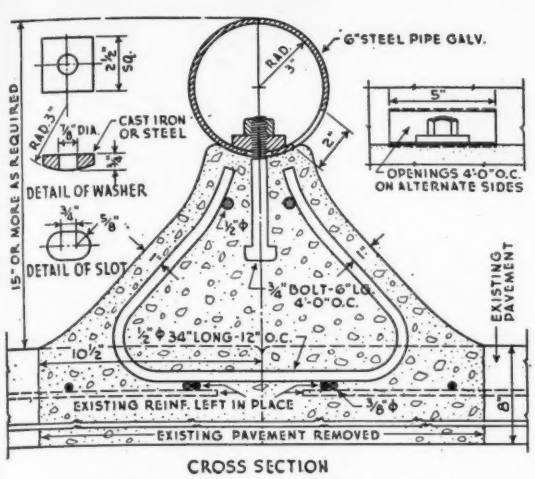
Highway Emergency Bills Passed

State legislatures this year have passed a number of bills reflecting wartime trends. Prominent among them are measures extending to governors extraordinary powers for controlling highway traffic, passed by California, Delaware, Vermont and Rhode Island. Delaware, South Carolina and Vermont provided for suspension of motor vehicle inspections. A Minnesota law reduces the age for issuing chauffeurs' licenses to 18 yrs. and permits restricted licenses at 16 yrs. New Hampshire, Kansas and Minnesota have lowered the age for chauffeurs' licenses to 16 yrs. and North Carolina to 15 yrs. Several states have authorized use of license tabs or stickers instead of plates; Ohio permits use of 1943 license plates for the duration and two years thereafter.

Concrete Traffic-Lane Separator Without Reinforcing

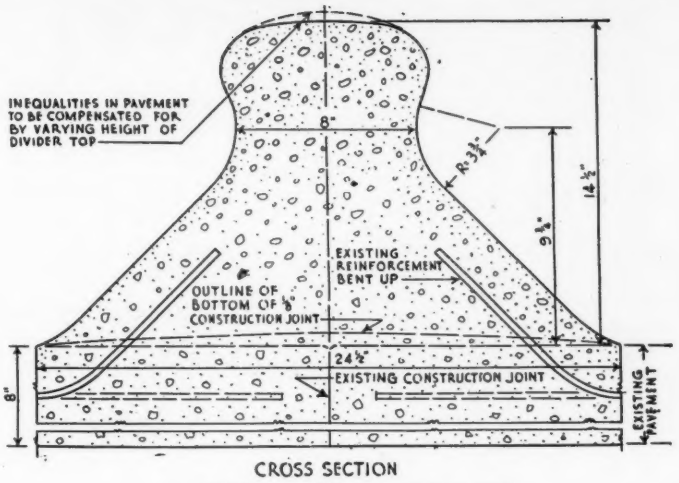
New York City has placed traffic-lane separators on a considerable mileage of concrete roads in its parkways. The first design included reinforcing bars, both lateral and longitudinal, in the separator base, and vertical hook bars bent to the shape of the separator and welded to the two longitudinal bars at 12-in. intervals. At the top was fastened a 6-in. galvanized steel pipe. When steel became scarce a new design was made eliminating all steel, which saved 15 tons of reinforcement per mile and 50 tons of pipe.

The separators were placed in reinforced pavements already constructed, and in the new design the old mesh reinforcement was bent up to an angle of about 45° to tie the separator to the pavement. The base was



CROSS SECTION

Old design of concrete traffic separator.



CROSS SECTION

Redesign, which uses no new steel.

widened from 21 in. to 24½ in. and a bull-nosed concrete top substituted for the steel pipe; which added about 70 cu. yd. of concrete per mile.

In constructing the new design, the limits of the channel to be cut out of the concrete pavement were scored about ⅜ in. deep by a pair of pneumatic chisels carried on a low wheel-mounted platform, which was guided by a disc attached to the cutter frame and running in the longitudinal center joint of the pavement. A pavement breaker mounted on the rear of a truck then shattered the concrete to within 4 in. of the scored lines. Following it was a crew of 6 men who removed the shattered concrete, cut the concrete along the scored lines with pneumatic drills, removed this, and bent the reinforcement up and back out of the way. Then the breaker went over the line again, using a steel point in place of the hammer head, and broke up the concrete below the reinforcement. The reinforcement was then bent to final position and wooden forms, in 8 ft. lengths, were set in place, anchored by tie wires and fastened to the bent up wire mesh, and sand bags were placed outside and clamps across the top to keep them from spreading. Concrete, delivered in 5½-yd. truck mixers, was chuted through a 5½ in. slot left open between the two forms. Two or three hours after the concrete had been placed, the forms were stripped and the concrete finished manually with wooden floats, and cured by spraying with a colorless curing compound. Nine miles of this separator were built by contract for $146,564.

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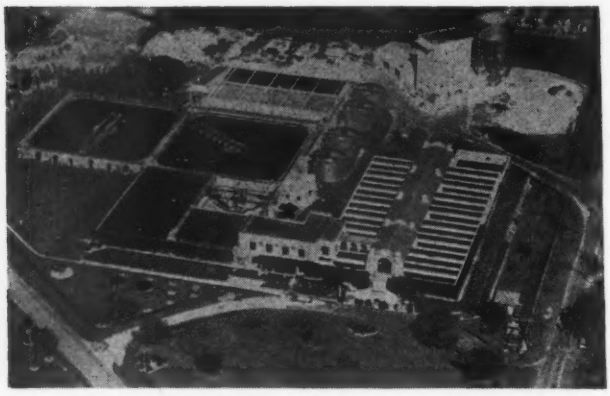


Aerial view of the Miami, Fla., water purification plant.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Canadian Water Quality Standards

Drinking water standards for Canada recently were put forward by an order-in-council of the Dominion government which are considered by the Canadian author to be "fundamentally unsound . . . could not be upheld in court, and are of limited value in judging the quality of a public water supply."[M4*]

Locating Reservoir Leaks

Leaks in the 6" concrete lining of a 10 mg reservoir at San Francisco were located by pumping air into drain pipes that extended around the perimeter of the base, under the joint between base and sides. With 6" of water over the bottom of the reservoir, bubbles appeared at leaky spots, even 100 ft. from the nearest point in the drain. The spots were marked, the water drawn off, and concrete patches applied. Then the water was raised to depths of 1 ft., 2 ft., etc., in succession, the leaks being noted and patched at each step. Although this method was successful here, it failed to locate leaks when tried in another reservoir.[E4]

Three Years of Water Supply Engineering

During the years 1940-1942 there has been a gradual tapering off of government subsidized construction for civilian purposes and increase in war construction. Since Dec. 7, 1941, every maker of water supply material has been swamped with orders. Those for cast iron pipe have increased 40 to 90%. Steel pipe production has reached an all-time maximum; so has reinforced concrete pipe, and cement-asbestos manufacture is at plant capacity.

Lining large pipe with concrete by a centrifugal traveling machine continues. About 50 miles of small pipe has been lined by the Australian process.

There is a decided tendency toward larger spillway capacity. An eastern state which in 1919 required a capacity of 600 c.f.s. for one sq. mi. required 3,000 in 1941. A New York City water supply engineer recommends using (6,000-10) A divided by the square root of A (area in sq. mi.).

There is great need of economical water treatment that will prevent rapid re-tuberculation after cleaning.[K2]

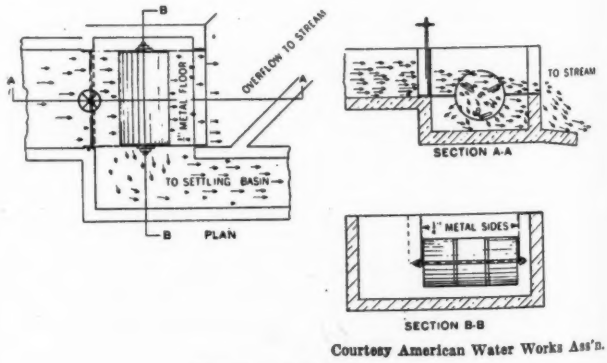
Preserving Phenol In Polluted Water

Experiments by the authors indicated that the *Standard Methods* method of preserving the phenol in samples of river water (by using 1.5 ml per litre of N/1 Na OH) is not satisfactory. Of several procedures studied, treatment with copper sulfate is most effective and was preferred. Phenol should preferably be determined in a sample shortly after collection. Where this is not possible, preservation with 3 ml of 10% copper sulfate solution per litre of sample, when the collection is made, is indicated, accompanied by refrigeration while in storage or transit. In no case should interval between collection and examination exceed two days.[A48]

*See Bibliography in the March issue.

A Self-Cleaning Trash Screen

Water for the town of Bishop, Calif., is taken from a creek through an open flume, and at times carries large amounts of trash. A screen that removes this successfully and needs no hand cleaning is shown by the illustration. A cylindrical screen rotates in the flume, the top moving in the direction of flow, rotation being caused by three hinged paddles inside the screen which engage stops on the ends of the screen when above the axis but swing free when below it. Part of the water that passes into the screen passes out again to the creek, taking with it the trash that has collected on the outside of the screen; the rest of it passes out of the bottom of the screen to the settling basin.[A49]



Courtesy American Water Works Ass'n.

Wood's self-cleaning screen.

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n,* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

A *Journal, American Water Works Ass'n*
March

45. Computation of Flows in Distribution Systems. By Weston Gavett. Pp. 267-287.
46. Identical Value Method for Solving Simple Pipe-Flow Problems. By A. A. Hirsch. Pp. 288-294.
47. Effect of Water Waste on Power Consumption. By Homer E. Beckwith. Pp. 295-298.
48. Preservation of Phenol Content in Polluted River Water Samples Previous to Analysis. By M. B. Ettinger, Stuart Schott and C. C. Ruchhoft. Pp. 299-302.
49. A Lazy Man's Water Works. By George L. Wood. Pp. 303-308.
50. Wartime Problems of the East Bay Municipal Utility District. By J. S. Longwell. Pp. 309-316.
51. Safety in Water Plants. By V. W. Buys. Pp. 317-319.

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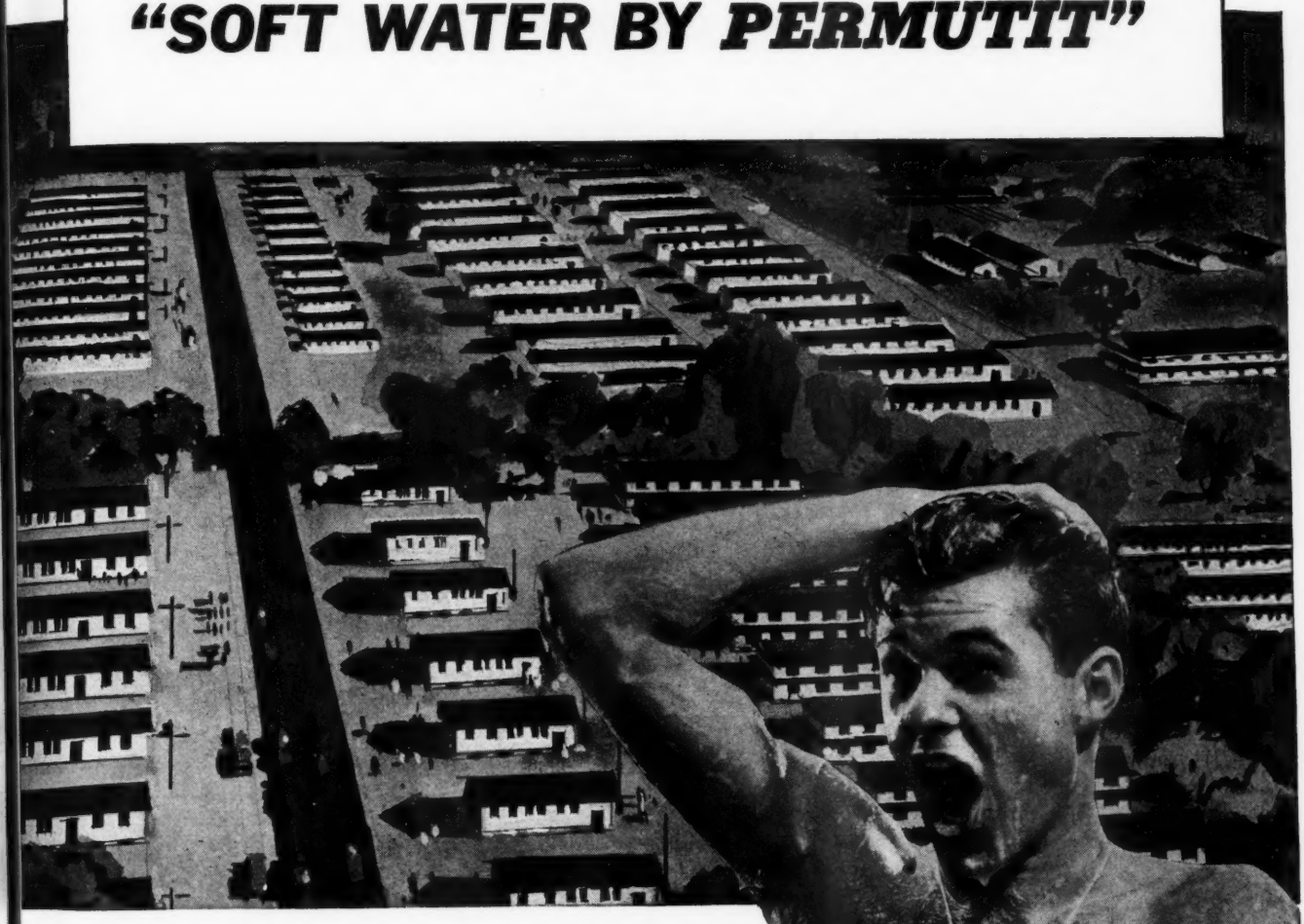

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WATER CONDITIONING HEADQUARTERS

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E *Engineering News-Record*
February 25
3. Laying Pipe Under Water With a Cradle. Pp. 70-71.
March 11
4. *n.* Locating Reservoir Leaks with the Aid of Air Bubbles. P. 102.

F *Water Works Engineering*
February 24
24. Treatment at Flint. By Nathan N. Wolpert. Pp. 198-201.
25. Maintenance of Protective Lighting Systems. By George A. Eddy. Pp. 205-207.
March 10
26. Diesel Cuts Pumping Cost 40%. By Wm. H. Gottlieb. Pp. 248-250.
27. *p.* A Lazy Man's Water Works. By George L. Wood. Pp. 253-255, 262.

G *Water Works & Sewerage*
February
12. *p.* Progress in Water Supply Preparedness in North Carolina. By Warren H. Booker. Pp. 69-70.

J *American City*
March
6. Price Control on a Wartime Waterworks Project. By Glenn E. Hands. Pp. 40-41, 71.
7. Modern Water Works Design. By Paul E. Langdon. Pp. 60-61.

K *Proceedings, American Society of Civil Engineers*
March
2. Water Supply Engineering. Report of Committee for 1939-42. Pp. 399-416.

L *Civil Engineering*
March
3. Lining Inclined Section of Delaware Aqueduct. By Charles G. Hoerner. Pp. 139-143.

P *Public Works*
March
14. *p.* Results Obtained by Hydro-Treators. P. 17.
15. Testing and Treating Water Supplies in Rural Districts. By Raymond F. Bishop and John F. Sanders. Pp. 18-20.
16. Construction of the Milton Seaman Dam by Greeley, Colo. By Roy E. Seaman and C. G. Klein. Pp. 24, 26.
17. *n.* Recovery of Hydrant Rentals. P. 26.
18. *p.* Velocity in Filter Washing. P. 36.

V *Journal, Maine Water Utilities Ass'n*
March
2. Maintenance and Repair Branch, Corps of Engineers. By Capt. Francis J. McAlary. Pp. 50-55.

W *Johnson Nat'l Drillers Journal*
January-February
1. Gravel Treated Wells: Types and Methods of Construction. Pp. 1-5, 11.
2. Surface and Ground Water Conditions in December. Pp. 6-7, 10.

Free Water to Public Institutions

The only general restraints imposed under the Ohio Constitution on the distribution of water are that the rates charged be reasonable and that there be no unjust discrimination among the consumers served, taking into account their situation and classification. Under the Constitution and statutes, the Ohio Supreme Court holds, in a 4 to 3 decision (State v. Hickey, 137 Ohio St. 474, 30 N. E. 2d 802), that a municipality operating a waterworks possesses the power to supply water gratis to public, religious, educational or charitable institutions. The section of the Constitution which prevents municipal bodies from becoming stockholders in or furnishing money or credit to private corporations was held not applicable in mandamus proceedings on behalf of a hospital, a church, a children's aid society and a board of education to require a municipal director of public utilities to furnish free water to these institutions as public, religious, benevolent, educational or charitable institutions as required by city ordinances.

The dissent was on the ground that a gift of water to the institutions named in the ordinance must be at the expense of other water users without their consent, and that the city has no right or power to divert surpluses arising from the operation of the municipal waterworks to the general purposes of the city (Ohio General Code, section 3959), much less to private, though charitable or religious, organizations. "The giving of free water to these institutions is at least equivalent to a contribution of cash to their respective budgets. This is beyond the power of any municipality to do."

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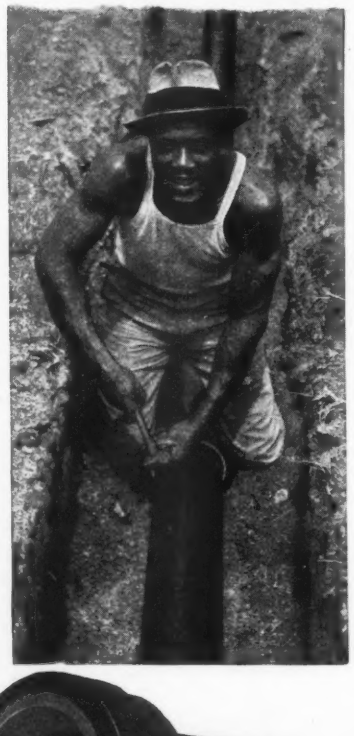

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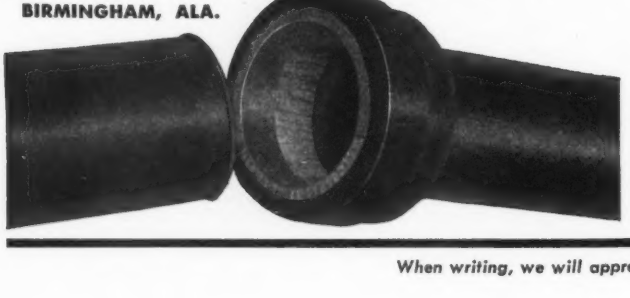

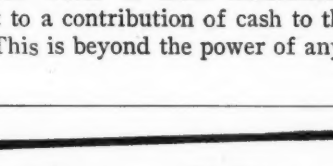

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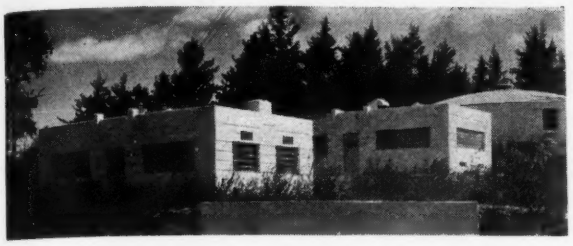


Sewage treatment plant at Bagley, Minnesota.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Vacuum Flotation for Sewage and Industrial Wastes

Vacuum flotation has been demonstrated to be a valuable adjunct in treatment of sewage and trade wastes; in the former, solely for removing scum and light, difficult-to-settle solids prior to clarification. A "Vacuator" has been developed by tests made by the Dorr Co. at the Los Angeles Terminal Island plant and at a West Coast refinery. The area requirement for floating grease and light solids is about the same as those for settling out heavy grit, permitting combination of the two in one structure. In many industrial waste problems it offers sufficient treatment so that the waste may be discharged into a municipal sewer system or body of water.

The liquid is aerated and the large bubbles allowed to escape. Then it is subjected, in a tank, to a vacuum of about 9 in. of mercury, which brings fine bubbles and floating solids to the surface, where they are skimmed off. At present, 21 vacuators have been installed in 14 plants, 4 of which are in regular operation, 2 on domestic sewage and 2 on cannery wastes.[E5]

Scrubbing Sewage Gas at Peru, Indiana

Due to the high sulphate content of Peru's water supply, the sewage gas normally contains 135 to 150 grains of hydrogen sulphide per 100 cu. ft. Canning wastes in the sewage increase this to 500 grains or more—more than could be removed by the iron-sponge scrubbers in use, although up to 100 grains they had proved satisfactory. A wet-type bubbling scrubber has been developed and installed; these followed in series by iron-sponge scrubbers seem to be an ideal treatment.

The wet scrubber consists of a tank, which the water (sewage plant effluent) enters at the top, is distributed by a perforated plate; passes down through 20 in. of 2½" to 5" stone that rests on a grate 7" above the bottom, and flows to a drain. The gas is distributed through 16 ½-in. openings 4" above the bottom, bubbles up through the 7" of water and rises through the stone and is withdrawn at the top. About three times as much gas is removed by bubbling as by passage through the contact bed.[G9]

Baking Powder In an Aeration Tank

At Pueblo, Colo., it was desired to destroy two tons of condemned baking powder in cans. It would not burn, and the treatment plant agreed to dispose of it. During a period of ten days the cans were emptied into the copperas feeder and fed into the flume just ahead of the aeration tank. (The plant capacity is 24 mgd.) The only noticeable effect was an increased pH and a small quantity of CO_2 in the sludge digestion tank.[H19]

Sewage Plant Raises Victory Garden

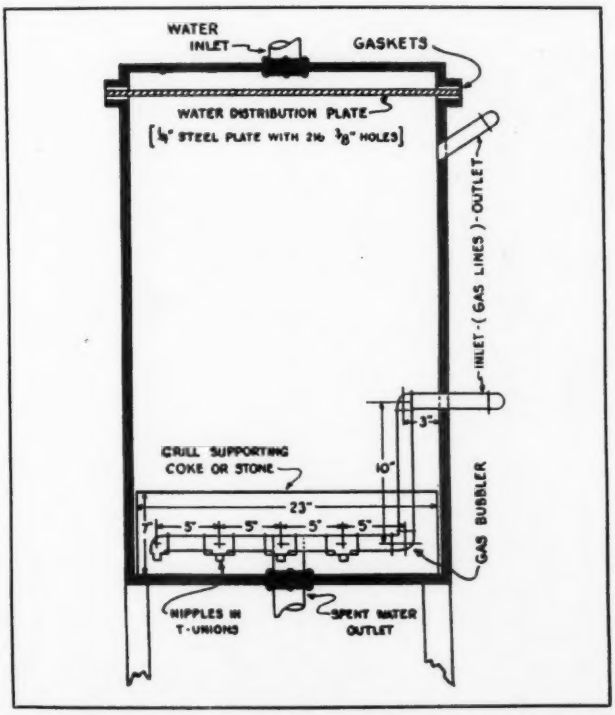
At the Rutherford, N. J., "Joint Meeting" sewage plant the sludge is being used this year, as it was last, in raising a Victory Garden, and incidentally, an effort is being made to demonstrate the beneficial effect of sludge to stimulate purchase by the public. Two 20 x 35 ft. plots were laid out, both planted in the same way but one using sludge for fertilizer, the other not. Sludge was plowed in at the rate of 60 tons per acre. Corn, tomatoes, turnips, beets, etc., were planted. The sludged plot needed less watering and the plants grew more rapidly. Weeds caused no trouble.[H17]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

D *The Surveyor*
January 22
11. Refuse Collection and Disposal in 1942. Pp. 39-40.
February 19
12. Sewerage and Sewage Disposal in 1942. Pp. 83-84.
E *Engineering News-Record*
February 25
5. Vacuum Flotation in Sewage Treatment. By A. J. Fischer. Pp. 57-61.
March 11
6. Wellpoints Eliminate Sheeting for Sewer. Pp. 109-111.
G *Water Works & Sewerage*
February
8. Developments in Sewerage and Sewage Treatment. By Charles Gilman Hyde and A. M. Rawn. Pp. 41-52.
9. Scrubbing Sewage Gas. By Harrold E. Norris. Pp. 61-64.
H *Sewage Works Engineering*
March
17. Victory Garden Demonstrates Sludge. By Albert B. Kozma. Pp. 133-134.



Courtesy Water Works & Sewerage

End view section through Peru's scrubber.

18. p. Stream Pollution Abatement to Cost a Billion Dollars. By Abel Wolman. Pp. 135-137.
19. Personnel and Materials Problems at Pueblo. By N. P. Nielson. Pp. 142-144.
20. Post-War Sanitation Planning Urged at National Conference. Pp. 145-150, 157.

P *Public Works*
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12. Three Years' Treatment of Sewage at Celina, O. By Paul A. Uhlmann. Pp. 13-17.
13. The Army Tries Garbage Disposal by Grinding. By Maj. R. N. Clark and Capt. Arthur Heifetz. Pp. 21, 38.
14. p. Pumping Sludge to and from Digestion Tanks. P. 36.
15. n. Sewer Charges Based on Actual Use. P. 36.

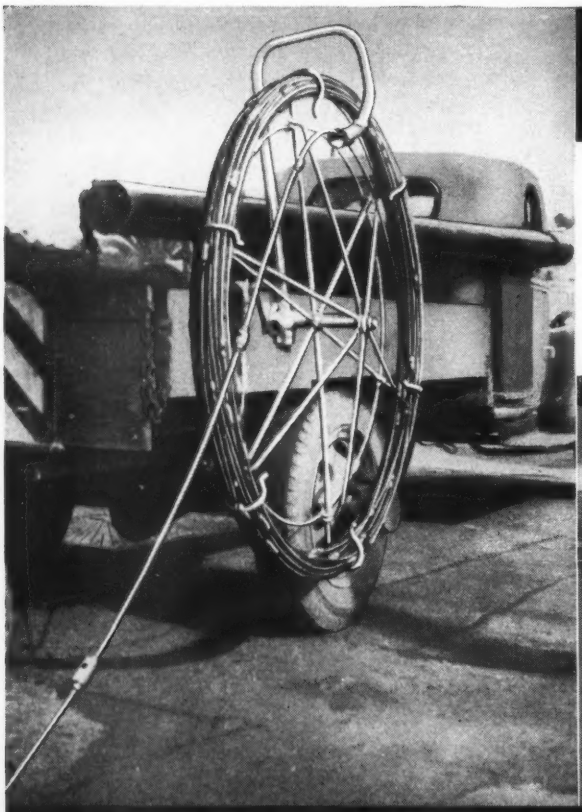
Recovery for Extra Work on Sewerage Construction

In an action against a city to recover extra compensation for work and material allegedly not included in plaintiff's contract for the construction of storm drains, the Maryland rule was followed by the Federal District Court for Maryland (Schiavi v. City of Baltimore, 40 F. Supp. 184), that where a contractor with a municipal corporation performs work or supplies materials which are not included in his contract, and they are accepted and retained by the municipal corporation and are beneficial to it, there arises an implied obligation on the corporation to pay herefor on the basis of the reasonable value thereof, that is, on quantum meruit. This rule also is held to apply where the contract itself is invalid and would be unenforceable if still to be executed, because of failure by the corporation to comply with some of the provisions of its charter or local governing law. And where a contractor undertakes to do certain work for an owner, and in the performance thereof unforeseen difficulties arise and thereupon the owner promises to pay the contractor additional compensation, the rule is that the contractor may recover on a quantum meruit or for the additional price agreed upon.

But these principles would not apply where there was no promise on behalf of the city to pay extra compensation and the work and material for which the extra compensation is claimed is not outside of the contract. And where the contract itself contains specific provisions as to the required procedure by the contractor in relation to claims for extra compensation, including particularly the provision that any dispute with respect thereto between the sewerage engineer and the contractor would be a condition precedent to the contractor's recovery therefor, these provisions are valid and binding, where there is no waiver by or estoppel of the municipality, and no indication of fraud or unfairness on the part of the city.

City's Liability for Stream Pollution

While the great weight of authority holds that the construction and institution of a sewer system is a governmental matter and that there is no liability for mere failure to construct sewers, the operation and upkeep of sewers is, by the great weight of authority, held not to be a governmental function but a ministerial or proprietary function of the city. And following the latter rule it was held that under the Ohio decisions a municipal corporation has no right to discharge sewage into a living stream to pollute the same, nor can it assist others to pollute a stream and avoid liability. Stone v. City of Ashland, Ohio. Court of Appeals, 32 N. E. 2d 560.



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Those now being used in water and sewage treatment plants are apparently effectively overcoming difficulties encountered prior to their use. E. S. Van Fleet, Boro Engineer, Somerville, N. J., reported a "better control of coagulant mixture and a saving in water flow" as a result of using a "Rotameter" to determine the amount of water needed to dissolve the chemical coagulant.

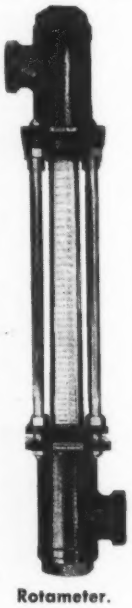
Clarence Bahlman, Sup'r. of Water Purification, Cincinnati, Ohio, writes, "Our rotameters are used to control the rate of flow of water into our chemical solution tanks.

"We use four Fischer & Porter size 6 rotameters, one for each of our four chemical solution tanks. The rotameters have been in use since late 1940, and have been entirely satisfactory. The rotameter tube is calibrated from zero to 4,000 lbs. of water per hour.

"We feed granular ferric sulphate continuously from a dry feeder into the solution tanks. This chemical cannot be 'drowned' with water, and proper solution can be obtained only by maintaining a proper ratio of water to chemical (from 2 to 6 times as much water, by weight, as chemical being used) and this ratio varies with the temperature of the water.

"Without means of speedily adjusting and maintaining proper quantities of water, the above chemical would not dissolve properly. The Rotameter is strictly satisfactory for this purpose."

"Rotameters" for chlorination work and for measuring hot water flow to the digesters were a part of the original installation at the new Cranston, R. I., sewage treatment plant. Supt. Walter H. Brown, Jr., says, "These 'Rotameters' have been very useful to us in metering our flow and have been trouble free from the start."



Rotameter.

Complete description of the "Rotameter" is contained in catalog PW4. Write Fischer & Porter Co., Hatboro, Pa., for a copy if you have a rate of flow problem.

Rudy P. Lowe, President, %Proportioneers, Inc.%

Rudy P. Lowe Elected President of %Proportioneers, Inc.%

%Proportioneers, Inc.%
Providence, R. I.

At the recent annual meeting Rudy P. Lowe, formerly Vice President and Chief Engineer of Proportioneers was elected President. Mr. Lowe was graduated from the Illinois Institute of Technology in 1922. For eight years he was a consulting engineer specializing in the building industry and then entered the water works field as consulting engineer. In 1932 he came to Providence to begin his career in the proportioning business and was made Vice President and Chief Engineer of Proportioneers, Inc.

The company states that Mr. Lowe becomes President at a time when proportioning equipment is playing an increasingly important role in wartime and that over 8700 Proportioneers are now serving the armed forces, municipalities and American industries. They are used as portable and permanent equipment in the sterilizing and conditioning of water for drinking, power and process use, and also in the manufacture of textiles, rayon, synthetic rubber, plastic, paints, aviation gasoline, etc.

To those having specific problems Proportioneers gladly offers the technical experience and process knowledge acquired through the many applications of their proportioning equipment.

The Clari-Filter—A New Type of Contact Filter

Lakeside Engineering Corp.
222 West Adams St., Chicago, Ill.

The manufacturer describes this new type of contact filter in a folder a part of which is as follows:

The Clari-filter is composed of a contact filter and clarifier built within a common wall. In a two stage Clarifilter installation three units are required, namely, a primary clarifier followed by two Clari-filter units in series. When a Clari-filter unit is preceded by trickling filters four units are needed, namely, a primary clarifier, trickling filter, intermediate clarifier and finally a Clari-filter.

The incoming sewage to the Clarifilter is equally distributed at the top of all of the contact plates since the inlet trough extends entirely around and above the top of the plates in the contact compartment. Good distribution develops better efficiencies.

The incoming sewage passes downward between the plates against the rising current of air which results in: (a) The grease in the primary filter being held above the plates from where it can be withdrawn periodically by means of a skimming trough located above the plates and along the wall of the tank, when the liquid level is raised in the tank by closing the outlet valve. (b) The light floc being held in the upper section of the contact compartment until it has become sufficiently heavy to pass downward against the rising current of air.

Troublesome hopper bottoms for collecting the sludge below the contact plates are eliminated since the arms of the clarifier scraper mechanism are extended underneath the contact plates.

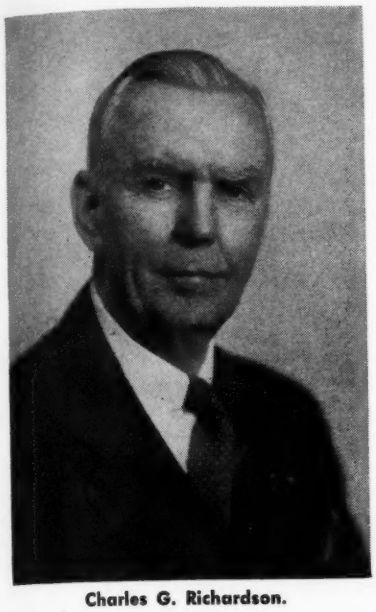
The folder gives a complete description and includes two pages of blueprints. Write for Bulletin 110.

Lakeside has issued another Bulletin No. 112 entitled "Aero-Filter Design Data." Some of the information included in this 30-page catalog is indicated by the following headings: Single Stage vs. Multiple Stage Treatment, Filter Loadings, Rates of Flow and Results, Single Stage Results Improved, Filter Depths, Recirculation, etc. It includes thirteen pages of blueprints. Copies of both of these publications will be sent upon request.

Builders-Providence, Inc., Felicitates Charles G. Richardson

The many friends of Charles G. Richardson in the Water Works and Sewerage fields will be glad to know that Builders Iron Foundry in Providence, R. I., and his associates in the employ of the company celebrated his forty years of service with that company on February 16th with a testimonial dinner. To honor him Builders' representatives came in from as far away as Chicago.

Reminiscence in the after-dinner speaking went back to a cold day in February 1903 when as a young man,



Charles G. Richardson.

Charlie, as he is known to his friends, knocked at the even then venerable portals of Builders Iron Foundry. Then, as now, Zechariah Chafee was president; and two renowned engineers, Clemens Herschel and Frederick R. Connet were respectively consulting engineer and chief engineer.

At that time the "Venturi Meter," consisting of the Venturi tube, invented by Herschel and the Type D Venturi register, invented by Connet, was just beginning to fulfill its mission of service that was to become world-wide.

Soon after his employment Mr. Richardson was made Mr. Connet's assistant, and in due course acquired assistants of his own; notably such neophytes as Dave Purdie and Alan Wood, a couple of young men whose service with Builders has passed the quarter-century mark.

Business in flow meters, controllers and related equipment is now conducted by Builders-Providence, Inc., a division of Builders Iron Foundry. Mr. Richardson has charge of sales to water and sewage works.

Speakers recounted how Charlie has made frequent pilgrimages to be helpful to those wrestling with the problems of bringing pure water to, and taking waste water from, the cities, towns, and villages of the nation. He has been active in the American Society of Civil Engineers, the American Water Works Assn., and the Federation of Sewage Works Assns.

"Get in the Scrap and Wipe the Axis Off the Map"

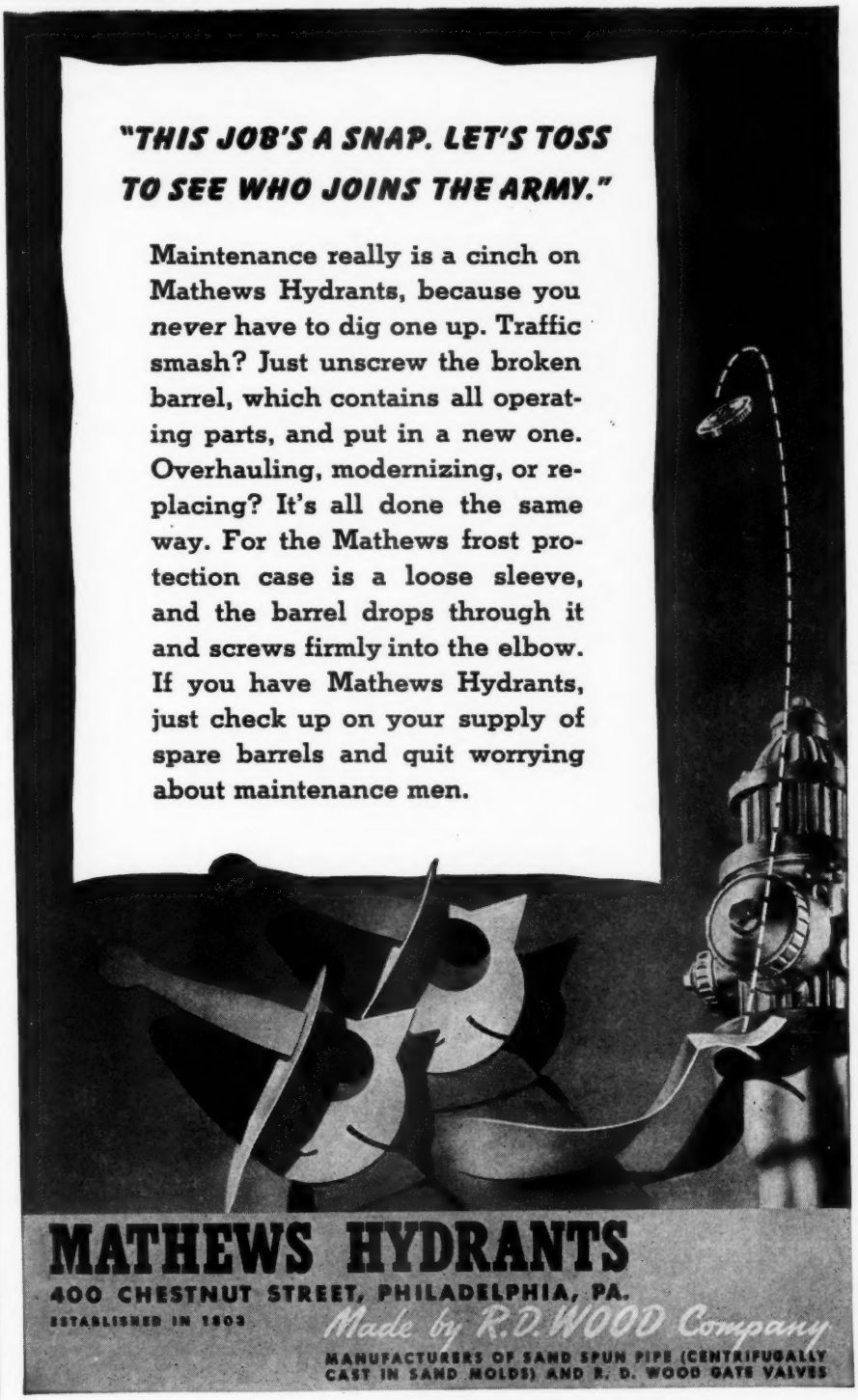
Donald M. Nelson, Chairman, War Production Board, says, "The unprecedented requirement now put upon our war industries to produce fighting equipment for full scale action this year means an unprecedented consumption of materials. Every branch of industry, as never before, is confronted with an imperative appeal to salvage more of all the critical materials so urgently needed for their production." Every time an American soldier spits fire at the axis, more scrap is needed to provide for the continuation of the deadly fire necessary to win the war. It is not a one-day job, a one-week job, or a one-month job . . . it is a duration job. It is estimated that 4900 lbs. of steel is required per fighting man and 2450 lbs. of scrap is needed to provide it. That scrap must come from industry and householders and every citizen of the U. S. A. should gladly cooperate to the utmost in providing it.

All metal scrap is urgently needed but the greatest need now is for copper, brass and bronze, iron, steel and aluminum.

It is the patriotic duty of every municipality and county to appoint a committee, if that has not already been done, whose duty it is to be sure that all equipment made of metal which is not in use and is not likely to be used for six months or a year, is scrapped now. Doing that is insignificant compared to what the flower of American youth is doing for those of us who are still on the home front.

Vapor Recovery Systems Co. Adds Seventh Addition to Factory

Due to the expansion program, instituted by Frank V. Long, The Vapor Recovery Systems Company of Comp-


"THIS JOB'S A SNAP. LET'S TOSS TO SEE WHO JOINS THE ARMY."
Maintenance really is a cinch on Mathews Hydrants, because you never have to dig one up. Traffic smash? Just unscrew the broken barrel, which contains all operating parts, and put in a new one. Overhauling, modernizing, or replacing? It's all done the same way. For the Mathews frost protection case is a loose sleeve, and the barrel drops through it and screws firmly into the elbow. If you have Mathews Hydrants, just check up on your supply of spare barrels and quit worrying about maintenance men.
MATHEWS HYDRANTS
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1903
Made by R.D. WOOD Company
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

When writing, we will appreciate your mentioning PUBLIC WORKS

New Life for OLD Sewers

Under today's war overload many sewer departments have considered the laying of new or larger sewers. Only to find that money, material, and labor shortages forbid for the present.

To you who face this problem we suggest *cleaned* sewers, thus restoring them to full capacity by using STEWART sewer cleaning equipment.

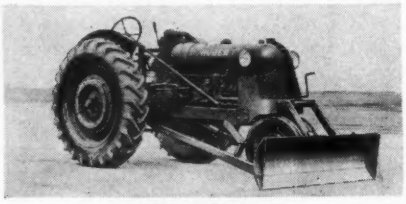
Whatever the job to be done, there is a STEWART rod, tool, or piece of equipment with which to do it best.

First Get This—

First get the new complete STEWART catalog. Check your needs by it. Then consult us about our various plans for making new sewer efficiencies possible. Rental or purchase. Address us without obligation.

W. H. STEWART
P. O. BOX 767 SYRACUSE, N. Y.
"Since 1901"

ton, California, manufacturers of "VAREC" Tank Equipment and Safety Devices, is completing its seventh addition to its main factory since Pearl Harbor. The new addition, which is five thousand square feet, will house the assembly and production lines. The "VAREC" policy of manufacturing all parts in "VAREC" approved Equipment "under one roof" is now in operation. This greatly facilitates keeping production schedules on time.



Huber Bulldozer.

Huber Bulldozer

Huber Mfg. Co.
Marion, Ohio

It was built especially to meet a situation brought on by the war. Its purpose is to swing into action at a moment's notice after bombs have left craters on airports, military roads, highways, and streets. The manufacturers say this little machine, smooth in operation, fast in action, levels off the broken surfaces promptly with a minimum of cost and for a small initial investment; it is versatile, will do everything a large bulldozer will do, but on a smaller scale in accordance with the job for which it is intended. And for speedy, light maintenance of airports and parkways during peacetime, the Huber Bulldozer offers the solution.

The moldboard is ⅜" thick and 6' long. The total width with blade is 20". The blade clearance in raised position is 22". Depth below ground—6". The moldboard is hydraulically controlled from operator's station. The moldboard and blade are pivoted to push pole and retaining arms to provide a cleaning action to the moldboard as it is raised. Approximate weight is 600 lbs.

Max W. Babb

Max W. Babb, chairman of the board of the Allis-Chalmers Mfg. Company, died March 13 in Milwaukee after an illness of several weeks. Mr. Babb, who had been board chairman since January, 1942, and the company's president for the ten years prior to that, was 68 years old.

He joined the Allis-Chalmers organization in 1904 as the company's attorney. In 1913 Mr. Babb was made vice-president and general attorney, and was closely associated with the late General Otto H. Falk in the management of the company. He succeeded Gen. Falk as president in 1932 when Falk became chairman of the board.

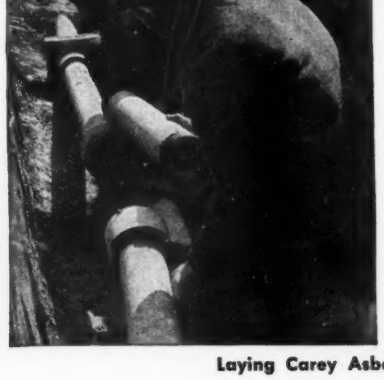
Carey Asbestos-Cement Conduit

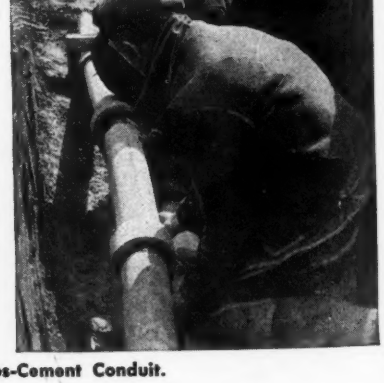
Philip Carey Mfg. Co.
Lockland, Cincinnati, Ohio

The manufacturers describe this new conduit pipe as follows: it is composed of an accurately proportioned mixture of asbestos fibre, portland cement and an added select grade of silica aggregate. This mixture, with water added to plasticize it, is then extruded to form internally and externally concentric surfaced tubes of circular cross section. The resultant is tough, hard and dense but light enough to be easily handled while being laid and stored.

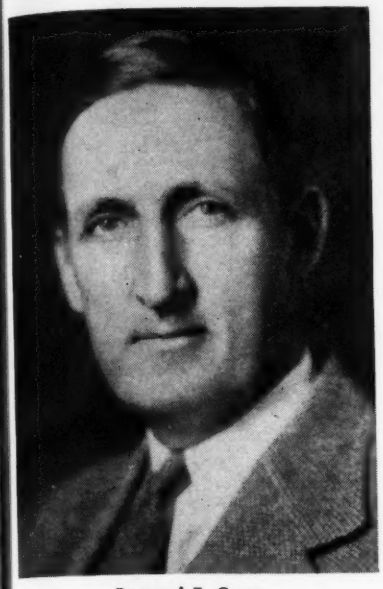
It is said to be immune to organic and inorganic acids; chemically inert to all materials used to insulate or armor cables; low on moisture absorption, immune to electrolysis, smooth interior, assembles rapidly and cheaply with simple tools.

The conduit is made in 5' lengths and can be easily cut. The conduit coupled with the Carey Flexcaulk coupling and joined with Carey's Conduit joint sealing compound, forms a flexible, watertight joint of exceptional quality. A folder is available describing this new conduit in detail including tests made for strength and instructions for installation.





Laying Carey Asbestos-Cement Conduit.



Bernard E. Gray,
General Manager, Asphalt Institute.

Bernard E. Gray Appointed General Manager of the Asphalt Institute

At the annual meeting of the Board of Directors of the Institute, Bernard E. Gray was promoted to the position of General Manager—adding the duties of that office to those already held as Chief Engineer—with the title of General Manager and Chief Engineer. Mr. Gray has been with the Institute for the past thirteen years, successively as Highway Engineer, Chief Highway Engineer and Chief Engineer.

Born Andover, Massachusetts. Graduated Tufts College, degree B.S. in Civil Engineering, later receiving honorary degree of C.E. Served with the Massachusetts Highway Commission on surveys and construction as Chief of Party and Resident Engineer, followed by several years with U. S. Bureau of Public Roads as Engineer-Economist, Highway Engineer and Senior Highway Engineer. Orientation Officer with 38th Artillery in World War I. Appointed 1919 member of Governor's Committee to write new State Highway Law of West Virginia, later Division Engineer and Chief of Maintenance for the State during its heavy construction era.

Member of Highway Research Board, West Virginia Professional Engineers' Association, etc. Author of numerous technical articles on design, construction and maintenance of highways and airports; co-author with Prevost Hubbard, Chemical Engineer of the Institute, of the textbook "Asphalt Pocket Reference for Highway Engineers." Residence, 135 Brewster Road, Scarsdale, New York.

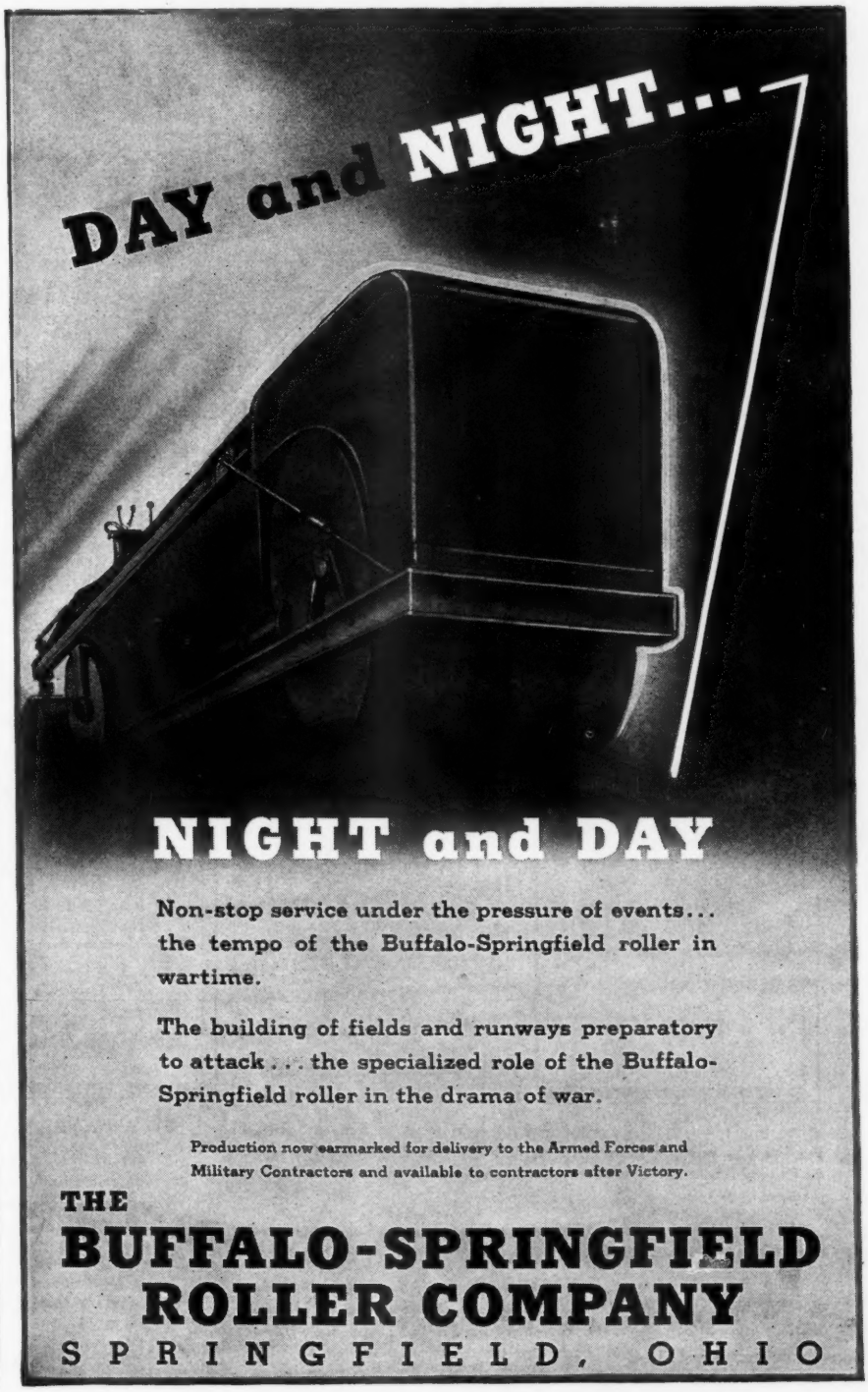
Engineers Develop New Air-Field Contact Light

Airport runway marker lights, called contact lights, indicate to the pilot the point of contact with the ground. They were first introduced about seven years ago and were seldom damaged by a landing plane. Designed to withstand a 35,000 pound dead-weight load the old lights were amply strong. Today big bombers and strato-liners would crash one of these button lighting units, and so a new design had to be developed. The new contact light will withstand deadweight loads of 100,000 pounds, according to Westinghouse engineers. The new construction utilizes the principle of bridge design, with truss sections and no cantilevers.

All strategic materials were avoided, saving three pounds of nickel and a quantity of aluminum used previously in the reflector. Rubber gaskets have been eliminated; shock-resisting glass and pre-focused lamps have been added. The two-element lens system has been replaced with a single lens, thereby obtaining an eight per cent increase in light efficiency. All manufacturers of this new light use the same standard mounting dimensions. Thus sub-assemblies made by any company will fit all other units. This fact makes the new contact light advantageous for use on military airports here and abroad.

Army-Navy "E" Awarded to Glamorgan Pipe & Foundry Co., Lynchburg, Virginia

The award was made on March 9th and the flag was raised in an impressive ceremony at the plant. The presen-


DAY and NIGHT...
NIGHT and DAY
Non-stop service under the pressure of events... the tempo of the Buffalo-Springfield roller in wartime.
The building of fields and runways preparatory to attack . . . the specialized role of the Buffalo-Springfield roller in the drama of war.
Production now earmarked for delivery to the Armed Forces and Military Contractors and available to contractors after Victory.
THE
BUFFALO-SPRINGFIELD
ROLLER COMPANY
SPRINGFIELD, OHIO

Gov. Darden, A. F. Lloyd, Col. John L. Person, Lt. W. H. Geppert, John D. Capron, Pres. of Glamorgan Pipe & Foundry Co., and Rep. Clifton A. Woodrum.

tation was made by Col. John L. Person of the Army's Chief Engineer's Office, Washington, and Lt. Col. W. H. Geppert, Naval Intelligence Service, Roanoke, Va., presented the employees' lapel pins.

The flag was accepted by John D. Capron, President and General Manager of the company since 1930, and Anthony Lloyd, an employee since 1916, received the lapel pins.

Col. Person told the employees that the award was by no means a gift but, rather, a recognition which "fits you on top of the industrial heap" and said further in making the presentation, "I present, on behalf of Under Secretary of War Robert Patterson and Under Secretary of Navy James Forrestal, this flag of excellent achievement in war production."

Among the distinguished guests was the Governor of Virginia, Hon. Colgate W. Darden, Jr. who said when referring to the award, "You belong to a group of less than 1% of the industrial power of the nation."

Mr. Capron, in accepting the award, said, "On behalf of the men and women of the Glamorgan Pipe & Foundry Co., I wish to express our very sincere appreciation for your kind words of commendation. Will you please convey our heart-felt thanks to the Hon. Robert A. Patterson, Under Secretary of War, and Under Secretary of Navy James Forrestal for the award of the Army-Navy "E" to our company. At this time we all renew our pledge to devote our whole effort to backing up our men on the fighting fronts."

Charles F. Thomas Dead

The many friends and acquaintances in the water works and sewage fields of Charles F. Thomas of Roberts Filter Manufacturing Co., Darby, Pa., will regret to learn that he passed away suddenly, Friday morning, April 2nd. He represented his company as a member of the Board of Governors of the Water Works and Sewerage Manufacturers Association and was present at the last meeting, March 31st.

Asphalt Institute Elects Officers

Initiates New Regional Plan. Reports 1942 Tonnage Close to Record-High

At their annual meeting the Board of Directors of The Asphalt Institute, representing most of the major petroleum asphalt producers of the United States and Canada, re-elected Herbert Spencer President, J. A. Blood, Standard Oil Company of California, was made Chairman of the Executive Committee—C. W. Barbour, Allied Materials Corporation, H. B. Pullar, Berry Asphalt Company, David Waxman, Shell Oil Company and Herbert Spencer completing the Committee. Bernard E. Gray was promoted from the position of Chief Engineer to that of General Manager and Chief Engineer.

Other officers elected were: Vice Presidents, C. W. Barbour, Allied Materials Corporation; A. M. Maxwell, Standard Oil Company (Ohio); Glenn Nielson, Husky Refining Company; H. G. Nevitt, White Eagle Division, Socony-Vacuum Oil Company, Inc.; H. B. Pullar, Berry Asphalt Company; F. V. Widger, The Texas Company; and Roger Williams, Standard Oil Company of Louisiana. George R. Christie, Standard Oil of New York was elected Secretary and Treasurer, with John N. Smith of the same Company as Assistant Treasurer.

Asphalt tonnage, despite curtailment of shipping facilities to the Atlantic Seaboard, continued at practically the record-high level of 1941, U. S. Bureau of Mines figures for 1942 showing a reduction of but 2 per cent.

Conventions and Association Meetings

May 4-7—Annual meeting of American Road Builders Association, Edgewater Beach Hotel, Chicago. It will be a Post-War parley. Sessions will be participated in by key Washington officials.

May 14-15 — Montana Section, American Water Works Association, Wartime Conference, Northern Hotel, Billings, Montana.

June 15-18 — American Water Works Association Annual Conference—Statler and Carter Hotels, Cleveland, O.

3 GREAT HELPS For Engineers and Superintendents

The Standard Sources of Unbiased Information About Equipment, Materials and Methods

When you want to know what type of equipment or material will do the job you have in mind—and what manufacturers make it—you can find the information easily and quickly in one of the special Manuals pictured here.

They are the standard sources of unbiased information about equipment, materials and methods.

These Manuals describe and illustrate every type of equipment and material available for use in the design, construction and maintenance of Highways, Streets, Airports, Water Works, Sewage Disposal and Sewer Systems. They explain what each type of product is intended to accomplish and outline briefly the latest approved methods to be followed.

"Your method of bringing to attention of designers, new equipment and materials for water plants should be a boon to municipalities everywhere, and I appreciate my copy more than I can express in words." A. C. N., City Manager.

A few copies of the 1942 edition of these valuable Manuals are left. If copies are not in your office write today for information on how to obtain them.

PUBLIC WORKS, 310 East 45th St., NEW YORK, N.Y.

Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Air Raid Shelters

2. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

10. A valuable treatise on available means of securing high strength, prevention of sealing, increased durability and improved wear resistance in concrete pavement construction. Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete

36. "Cutting Concrete Costs"—Booklet analyzes costs and outlines methods of figuring the lowest cost schedule. Notes on job planning. For copy, write Lone Star Cement Corp., 342 Madison Ave., New York, N. Y.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Drainage

71. Walker Poroswall Rapid Drain Pipe for Drainage or Water Collection is claimed to be the fastest drainage medium known. Send for latest literature explaining its many uses. Walker Cement Products Co., Little Ferry, N. J.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil

109. Ring-Free Motor Oil that keeps motors clean and free from carbon, and reduces frequency of overhauls is described in literature available from Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester,

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Gallon Iron Works & Mfg. Co., Gallon, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set

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forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints, jetting pumps, with tables, diagrams, and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati, O.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 322 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Blowers

379. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Chlorinators, Portable

380. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

381. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Cleaning Sewers With Own Forces

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

384. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

Consulting Engineers

385. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

Filters

388. How to increase the capacity of filters through use of Anthrafilt and complete data on use of Anthrafilt for filters and sludge beds is contained in a revised pocket Manual issued by Anthracite Equipment Corp. For free copy write H. G. Turner, State College, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., 332 So. Michigan Ave., Chicago, Ill.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 41 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

Maintenance

404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa

Pipe, Lock Joint

412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints, Sewer

415. How to make a perfect sewer pipe joint—tight, prevents roots entering sewer, keeps lengths perfectly aligned; can be laid with water in trench or pipe. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet

describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham, Ala.

Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer Joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York, N. Y.

Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

465. Grit Washers and Collectors, by Jeffrey are built in three types: scraper, V-bucket and combination. For full details ask for Jeffrey Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

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Valves (See Gates, Air Release, etc.)

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

Water Works Operating Practices

490. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Stuart-Brumley Corp., 516 No. Charles St., Baltimore, Md.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

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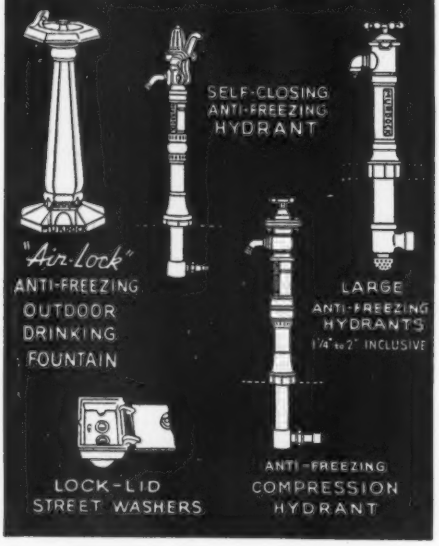

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LETTERS
to the Editor

DEPARTMENT OF WATER WORKS
Atlanta, Georgia.

Dear Sir:

Mr. Smith and I appreciate your prompt response to my letter relative to the feasibility of bi-monthly or quarterly meter reading and billing instead of our present monthly practice.

You covered each phase of the problem very fully and made several comments and suggestions which will be used in our program if we decide to make a change.

We will be able to carry on with our regular monthly program if no further employees are lost to the armed forces or allied industries. Should it be necessary to make a change on account of manpower shortage I am of the opinion that we will go to bi-monthly meter reading and billing.

Your cooperation and counsel in this matter are most gratifying and appreciated.

Yours very truly,

PAUL WEIR,
Asst. General Manager.

NEW APPOINTMENTS

New City and County Officials recently reported:

City Engineers

S. B. Palmer, Norwich, Conn.
L. H. Murray, Mt. Carmel, Ill.
A. E. Hansen, Muskegon, Mich.
Sam F. Heffner (Acting), Bradford, Pa.
Paul Straub, Frackville, Pa.
Harry C. Rothrock, Norristown, Pa.
Erin Leonard, Price, Utah.

Water Works Superintendents

J. S. Lamar, Selma, Ala.
Jeremiah Kane, Norwich, Conn.
Thos. H. Harrold, Mt. Carmel, Ill.
G. Norrenberg, Willmette, Ill.
Oscar Eden, Rushville, Ind.
W. T. Beckett, Bossier City, La.
Arthur H. Makepeace, Monson, Mass.
Baxter F. Wade, Jackson, Miss.
John P. Field, Hoboken, N. J.
W. F. Ainsley, Hertford, N. C.
M. C. Thomas, Cheraw, S. C.
Alfred Ross, Huron, S. D.
R. F. Brumback, Ennis, Tex.
T. C. Hart, Odessa, Tex.
W. B. Messer, Robstown, Tex.

County Engineers and Officials

H. B. Blackwell, Calhoun Co., Anniston, Ala.
N. L. Mayner, Franklin Co., Ozark, Ark.
Roy L. George, Mesa Co., Grand Junction, Colo.
B. G. Moore, Columbia Co., Lake City, Fla.
C. W. Foote, Gooding Co., Wendell, Idaho.
C. F. Goldsmith, Lyon Co., Emporia, Kan.
O. B. Sims, Barron Co., Glasgow, Ky.
B. M. Bertram, Wayne Co., Monticello, Ky.
John Q. Hite, Logan Co., Russellville, Ky.
P. E. Richards, Madison Co., Fredericktown, Mo.
O. C. Hughes, Davies Co., Gallatin, Mo.
T. J. Thompson, Clay Co., Liberty, Mo.
J. Louis Curtis, Cumberland Co., Bridgeton, N. J.
Edward H. Maier, Cumberland Co., Bridgeton, N. J.
John J. Tull, Camden Co., Camden, N. J.
Roi C. Collins, Union Co., Elizabeth, N. J.
Ralph Killen, Hunterdon Co., Flemington, N. J.
Raymond E. Shorter, Morris Co., Morristown, N. J.
Benjamin F. DuBois, Gloucester Co., Woodbury, N. J.
Chas. O. Topper, Ashtabula Co., Jefferson, Ohio.
J. E. D. Hartinger, Meigs Co., Pomeroy, Ohio.
Thos. M. Moran, Caddo Co., Anadarko, Okla.
Dean Rounds, Pennington Co., Rapid City, S. D.
Charles Fisher, Edmunds Co., Roscoe, S. D.
Frank Maloney, Knox Co., Knoxville, Tenn.
Clark Scott, Blount Co., Marysville, Tenn.
Otis E. Pemberton, Morgan Co., Wartsburg, Tenn.
C. H. Yeager, Thurston Co., Olympia, Wash.
Henry Wolf, Dunn Co., Menominee, Wis.
Perry Worden, Portage Co., Stevens Point, Wis.

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